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By: Angela Cassidy Date: 6-16-09

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PREAMBLE

It is agreed to by the Parties hereto to amend the May 9, 1986 Director's Final Findings and Orders (1986 Orders). Except for the modifications noted herein, the terms contained in all Sections of the 1986 Orders apply:

I. JURISDICTION

1. These Director's Final Findings and Orders ("Orders") are issued to Respondent PCC Airfoils, LLC ("PCC Airfoils") and Respondent Northrop Grumman Space & Missions Systems Corp. ("NGS&MSC") pursuant to the authority vested in the Director of Ohio EPA under Ohio Revised Code ("ORC") §§ 3734.13, 6111.03, and 3745.01.

II. PARTIES BOUND

2. These Orders shall apply to and be binding upon Respondents and their successors in interest liable under Ohio law.

3. No change in ownership or corporate status of the Respondents including, but not limited to, any transfer of assets or real or personal property shall in any way alter Respondents' obligations under these Orders.

4. Work Respondent shall provide a copy of these Orders to all contractors, subcontractors, laboratories and consultants retained to conduct any portion of the Work performed pursuant to these Orders within fourteen (14) days of the effective date of these Orders or upon date of retention. Work Respondent shall ensure that all contractors, subcontractors, laboratories and consultants retained to perform the Work pursuant to these Orders also comply with the applicable provisions of these Orders.

III. DEFINITIONS

5. Unless otherwise expressly provided herein, all terms used in these Orders or in any appendices shall have the same meaning as defined in ORC Chapters 3734 and 6111, CERCLA, and the rules promulgated thereunder. Whenever the terms listed below are used in these Orders or in any appendices, attached hereto and incorporated herein, the following definitions shall apply:

- A. "CERCLA" means the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. 9601 et seq.

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- B. "Contaminant" and "Contamination" means (1) any "hazardous waste" under ORC §3734.01(J); (2) any "industrial waste" under ORC §6111.01(C); and (3) any "other wastes" under ORC §6111.01(D), including any release of one or more of the same.
- C. "Day" means a calendar day unless expressly stated to be a business day. "Business day" shall mean a day other than a Saturday, Sunday, or state holiday. In computing any period of time under these Orders, where the last day would fall on a Saturday, Sunday, or state holiday, the period shall run until the close of the next business day.
- D. "Decision Document" means the document detailing the remedial action selected by Ohio EPA for the Site after review of the Feasibility Study Report generated by the Work Respondent after it conducts the Feasibility Study. The Decision Document formalizes the remedy chosen in the Preferred Plan.
- E. "Facility" means the former TRW facility located at 3860 Union Avenue Southeast, Minerva, Stark County, Ohio. The Facility property totals approximately 135 acres and encompasses the following Stark County parcels: 4201261, 4201486, 4201488, 4201490, 4100935, 4201487, 4201489, and 4201476. PCC Airfoils owns parcels 4201261, 4201486, 4201488, 4201490, 4100935 totaling 112.74 acres. Respondent NGS&MSC (formerly TRW, Inc.) owns parcels 4201487, 4201489, and 4201476, totaling 22.65 acres
- F. "Feasibility Study" ("FS") means a study undertaken to develop and evaluate options for remedial action and is more fully described in the SOW. The FS is generally performed concurrently and in an interactive fashion with the Remedial Investigation. The term also refers to a report that describes the results of the study.
- G. "NCP" means the National Oil and Hazardous Substances Pollution Contingency Plan, codified at 40 C.F.R. Part 300 (1990), as amended.
- H. "Ohio EPA" means the Ohio Environmental Protection Agency and its designated representatives.
- I. "Orders" means these Director's Final Findings and Orders and all attachments hereto.
- J. "Paragraph" means a portion of these Orders identified by an Arabic numeral or an uppercase or lowercase letter.

- K. "Parties" means Respondents and the Ohio EPA.
- L. "Preferred Plan" means the plan chosen by Ohio EPA to remediate the Site in a manner that best satisfies the evaluation criteria outlined in the NCP. Such a plan may include remedial actions planned and/or completed.
- M. "Pre-Investigation Evaluation Report" ("PER") means the document prepared by Respondent and submitted to Ohio EPA on September 3, 2008, and the letter (Data Gap Acceptance Letter) provided by Work Respondent to Ohio EPA indicating agreement with the data gaps. The PER and Data Gap Acceptance Letter are attached hereto as Attachment A and incorporated herein by reference.
- N. "Property" means the Facility property totaling 135 acres and encompassing the following Stark County parcels: 4201261, 4201486, 4201488, 4201490, 4100935, 4201487, 4201489, and 4201476.
- O. "Remedial Action" ("RA") means those activities already taken or to be undertaken by Work Respondent to implement and maintain the effectiveness of the final plans and specifications submitted by Work Respondent pursuant to the Remedial Design and Remedial Action Work Plan.
- P. "Remedial Design" ("RD") means those activities already taken or to be undertaken by Work Respondent to develop the final plans and specifications for the Remedial Action pursuant to the Remedial Design and Remedial Action Work Plan.
- Q. "Remedial Design and Remedial Action Work Plan" ("RD/RA Work Plan") means the document submitted by Work Respondent and approved by Ohio EPA pursuant to the Performance of Work Section of these Orders.
- R. "Remedial Investigation" ("RI") means a process undertaken to determine the nature and extent of Contamination at the Site. The RI emphasizes data collection and Site characterization, and is generally performed concurrently and in an interactive fashion with the Feasibility Study. The RI includes sampling and monitoring, as necessary, and includes the gathering of sufficient information to determine the necessity for remedial action and to support the evaluation of remedial alternatives. The term also refers to a report that describes the results of the investigation.
- S. "Remedial Investigation and Feasibility Study Work Plan" ("RI/FS Work Plan") means the document submitted by Work Respondent pursuant to the Performance of Work Section of these Orders and approved by Ohio EPA

pursuant to the Review of Submissions Section of these Orders.

- T. "Respondents" means PCC Airfoils, LLC, and Northrop Grumman Space & Missions Systems Corp.
- U. "Response Costs" means all costs incurred in a manner not inconsistent with the NCP including, but not limited to, payroll costs, contractor costs, travel costs, direct costs, overhead costs, legal and enforcement related costs, oversight costs, laboratory costs, and the costs of reviewing or developing plans, reports, and other items pursuant to these Orders, verifying the Work, or otherwise implementing or enforcing these Orders.
- V. "RI/FS Statement of Work" ("RI/FS SOW") means the Generic Statement of Work for Conducting Remedial Investigation and Feasibility Studies" for the implementation of the Remedial Investigation and Feasibility Study at the Site, as set forth in Attachment B to these Orders. The RI/FS SOW is not specific to any Site.
- W. "RD/RA Statement of Work" ("RD/RA SOW") means the Generic Statement of Work for the implementation of the Remedial Design and Remedial Action at the Site, as set forth in Attachment C to these Orders. The RD/RA SOW is not specific to any Site.
- X. "Section" means a portion of these Orders identified by a roman numeral.
- Y. "Site" means the Facility located at 3860 Union Avenue Southeast, Minerva, Stark County, Ohio where the treatment, storage, and/or disposal of hazardous waste, and/or the discharge to waters of the state of industrial waste or other wastes have occurred, including any other area where such hazardous wastes, industrial wastes, and/or other wastes have migrated or threaten to migrate.
- Z. "Supporting Documents" means the field sampling plan ("FSP"), quality assurance project plan ("QAPP"), and health and safety plan ("HASP") developed concurrently with the RI/FS Work Plan and the RD/RA Work Plan pursuant to these Orders and Section 2 of the RI/FS SOW and Section 4 of the RD/RA SOW.
- AA. "Transferee" means any future owner of any interest in the Site, including but not limited to, owners of an interest in fee simple, mortgagors, easement holders, and lessees.
- BB. "Work" means all activities Work Respondent has performed pursuant to the 1986 Orders, as well as all activities Work Respondent is required to perform

under the Performance of Work and Additional Work Sections of these Orders.

- CC. "Work Respondent" means Respondent Northrop Grumman Space & Mission Systems Corp. (NGS&MSC).

IV. FINDINGS

6. All of the findings necessary for the issuance of these Orders pursuant to ORC §§ 3734.01, 6111 01 and 3745.01 have been made and are outlined below. Nothing in these Orders, or attachments thereto, shall be considered to be an admission by Respondent of any matter of law or fact.

- A. Respondent PCC Airfoils owns 112.74 acres of the Property and Respondent NGS&MSC owns 22.65 acres of the Property. TRW, Inc. (now known as NGS&MSC) owned and operated the Facility as a metal casting operation until June 27, 1986, when it sold the buildings and the majority of the Property to Respondent PCC Airfoils. The Facility is currently operated by Respondent PCC Airfoils as a metal casting operation.
- B. Respondent PCC Airfoils is a limited liability company authorized to do business in Ohio. Respondent PCC Airfoils' principal place of business is located at 25201 Chagrin Boulevard, Suite 290, Beachwood, Ohio 44122.
- C. Respondent NGS&MSC is a for-profit corporation authorized to do business in Ohio. Its principal place of business is located at 1840 Century Park East, Los Angeles, California 90067
- D. Beginning in approximately 1984, and continuing to present, Work Respondent has been investigating and remediating the Site with Ohio EPA oversight.
- E. On March 31, 1989, the Site was listed on the NPL.
- F. Ohio EPA has incurred Response Costs and continues to incur Response Costs associated with this Site.
- G. Modification of the 1986 Orders is needed to: i) include provisions for the investigation of new sources of Contamination that were not contemplated in the 1986 Orders and, therefore, were not adequately addressed by the 1986 Orders; ii) develop and/or compile existing data for the entire Site that will enable Ohio EPA to issue a Decision Document for the Site; and iii) design and implement the Decision Document to ensure compliance with the NCP process.

V. GENERAL PROVISIONS

7. Amendment to 1986 Orders

The provisions of the 1986 Orders are modified only as specifically set forth in the Orders section of these Orders. Any provisions not specifically amended remain in full force and effect as written therein.

8. Objectives of the Parties

These Orders amend the 1986 Orders and add provisions that focus solely on the completion of the investigation and remediation of contaminated soil and groundwater at the Site. These Orders will result in a remedy being completed in accordance with the NCP process. The objectives of the Parties in entering into these Orders are to protect public health and safety and the environment from the disposal, discharge, or release of Contaminants through Work to address the data gaps identified in the PER to complete the RI/FS, design and construction of the Remedy, and development and implementation of a final operation and maintenance plan by Work Respondent as set forth in a Decision Document that will be issued by Ohio EPA following the performance of the RI/FS by Work Respondent. Work Respondent shall perform, in order to address the data gaps identified in the PER, the RI/FS and RD/RA to:

- A. Complete the Investigation of the nature and extent of releases of Contaminants at the Site;
- B. Assess risk to human health and the environment;
- C. Implement interim actions if necessary to address substantial threats;
- D. Collect sufficient additional data to support decisions regarding a remedial action for the Site;
- E. Develop and evaluate any additional potential remedial alternatives;
- F. Design any selected remedy, as concurred with by Ohio EPA;
- G. Construct any designed remedy; and
- H. Operate and maintain any constructed remedy.

9. Commitment of Work Respondent

Consistent with the Objectives of the Parties enumerated in paragraph 8 of these Orders, Work Respondent agrees to perform the Work in accordance with these Orders including but not limited to any additional activities necessary to complete the RI/FS SOW, RD/RA SOW, all relevant guidance documents, and all standards, specifications, and schedules as approved by Ohio EPA pursuant to these Orders. Work Respondent also agrees to reimburse Ohio EPA for all Response Costs and perform all other obligations of these Orders.

10. Compliance with Law

- A. All activities undertaken by Respondents pursuant to these Orders shall be performed in accordance with the requirements of all applicable federal, state and local laws and regulations, and in a manner consistent with the NCP.
- B. Ohio EPA believes that activities conducted pursuant to these Orders, if approved by Ohio EPA, would be considered necessary and consistent with the NCP. If Ohio EPA determines that an activity was conducted consistent with these Orders, Ohio EPA believes the activity would be considered consistent with the NCP.
- C. Where any portion of the Work requires a permit, license or other authorization from Ohio EPA or any other state, federal or local government agency, Respondents shall submit applications in a timely manner and take all other actions necessary to obtain such permit, license or other authorization. These Orders are not, and shall not be construed to be, a permit, license or other authorization issued pursuant to any statute or regulation.

VI. ORDERS

- 11. Amendment to Section V of the 1986 Orders
 - A. Section V. Work to be Performed paragraphs A.1; A.2; A.4; A.7, and V.B remain unchanged and in full force and effect as set forth in the 1986 Orders;
 - B. Section V. Work to be Performed paragraphs A.3; A.5; and A.6 are hereby deleted;
 - C. Paragraph V.A.8 of the 1986 Orders remains unchanged with the exception of the following modifications:

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- i. Paragraph V.A.8b. of the 1986 Orders is modified by these Orders to read as follows: "Groundwater quality reaches background or 1×10^{-5} cancer risk concentrations for the parameters of concern; or. . ."; and
 - ii. The last paragraph of V.A.8. is modified by these Orders to read as follows: "Failure to achieve compliance with applicable criteria at the compliance monitoring points will result in additional corrective actions by Respondent to be specified by Ohio EPA. These additional corrective actions may be, but not limited to, additional actions proposed by Respondent and shall be incorporated into this Order as an amendment thereto." The reference to the dispute resolution section is hereby deleted since the Dispute Resolution Section of these Orders wholly replaces the dispute resolution procedures set forth in the 1986 Orders.
 - D. Paragraph V.C. is hereby deleted;
 - E. Paragraph V.D. is hereby deleted; and
 - F. Paragraph V.E. is hereby deleted.
 - G. The text in the last sentence of the second full paragraph in Section VIII of the 1986 Orders is amended and shall read as follows: "Work Respondent shall notify Ohio EPA not less than seven (7) days in advance of any sample collections activity."
12. The 1986 Orders are amended to include a "**PERFORMANCE OF WORK BY WORK RESPONDENT**" Section that shall read as follows:
- A. Supervising Contractor

All Work performed pursuant to these Orders shall be under the direction and supervision of a contractor with expertise in hazardous waste site investigation and remediation. Prior to the initiation of the Work, Work Respondent shall notify Ohio EPA in writing of the name of the supervising contractor and any subcontractor to be used in performing the Work under these Orders.
 - B. Remedial Investigation and Feasibility Study
 - i. RI/FS project initiation meeting / Site visit. Within fourteen (14) days of the effective date of these Orders, unless otherwise agreed to by the Parties, Work Respondent shall:
 - a. meet with Ohio EPA to discuss, as described in Section 1.1 of the

RI/FS SOW, Work Respondent's performance of the Work required under these Orders; and

b. coordinate with Ohio EPA to establish a date for a Site visit.

ii. Submission of RI/FS Work Plan. Within sixty (60) days of the effective date of these Orders, unless otherwise specified in writing by Ohio EPA, Work Respondent shall submit to Ohio EPA the RI/FS Work Plan and the Supporting Documents for the Site. The RI/FS Work Plan shall incorporate and be based on the PER. Paragraph 12.B.iii. herein refers to the criteria for development of the RI/FS Work Plan.

iii. Criteria for RI/FS Work Plan development. The PER, the RI/FS Work Plan, Supporting Documents and any other deliverables required under the approved RI/FS Work Plan, shall be developed consistent with the RI/FS SOW contained in Attachment B of these Orders and the guidance documents listed in Attachment D of these Orders. The RI/FS Work Plan shall include a proposed schedule that includes a completion date for each task. If, during the pendency of the Work, Ohio EPA determines that any additional or revised guidance documents affect the Work to be performed in implementing the RI/FS, Ohio EPA will notify Work Respondent, and the PER, RI/FS Work Plan, and other affected documents, if any are affected, shall be modified by Work Respondent accordingly.

iv. Handling of any inconsistencies. Should Work Respondent identify any inconsistency between any of the laws and regulations and guidance documents which they are required to follow by these Orders, Work Respondent shall notify Ohio EPA in writing of each inconsistency and the effect of the inconsistencies upon the Work to be performed. Work Respondent shall also recommend, along with a supportable rationale justifying each recommendation, the requirement Work Respondent believes should be followed. Work Respondent shall implement the affected Work as directed in writing by Ohio EPA.

v. Review by Ohio EPA. Ohio EPA will review the RI/FS Work Plan and Supporting Documents pursuant to the procedures set forth in the Review of Submissions Section of these Orders.

vi. Implementation of RI/FS Work Plan. Upon Ohio EPA's approval of the RI/FS Work Plan, Work Respondent shall implement the RI/FS Work Plan as approved. Work Respondent shall submit all plans, reports, or other deliverables required under the approved RI/FS Work Plan, in accordance with the approved schedule, for review and approval pursuant to the Review of Submissions Section of these Orders.

C. Preferred Plan and Decision Document

Based upon the approved RI/FS, the Preferred Plan for remedial action shall be prepared by the Ohio EPA for public review and comment. This Preferred Plan shall be prepared pursuant to Ohio EPA's policy titled "Preferred Plan and Decision Document Procedures," DERR-00-RR-013. Following the public comment period, Ohio EPA may revise the Preferred Plan in response to those comments or may finalize the Preferred Plan without change.

The selection of the preferred alternative shall be documented by Ohio EPA in a Decision Document for the Site. This Decision Document shall include a summary of the RI/FS, a summary of the remedy selection decision and a responsiveness summary. The activities required by this paragraph shall be performed pursuant to Ohio EPA's Preferred Plan and Decision Document Procedures.

D. Remedial Design and Remedial Action

i. RD/RA project initiation meeting. Within fourteen (14) days of the issuance of the Decision Document, unless otherwise mutually agreed to by the Parties, Work Respondent shall meet with Ohio EPA to discuss the requirements of the RD/RA Work Plan.

ii. Submission of RD/RA Work Plan. Within sixty (60) days after the issuance of the Decision Document, unless otherwise specified in writing by Ohio EPA, Work Respondent shall submit to Ohio EPA a RD/RA Work Plan and schedule for implementation of the Work required under the Performance of Work Section of these Orders. The RD/RA Work Plan shall provide for the design, construction, final operation and maintenance of the remedy as set forth in the Decision Document. Paragraph 14.c. herein refers to the criteria for development of the RI/FS Work Plan

iii. Criteria for RD/RA Work Plan development. The RD/RA Work Plan, Supporting Documents, and any other deliverables required under the approved RD/RA Work Plan shall be developed in conformance with the RD/RA SOW contained in Attachment C of these Orders, and the guidance documents listed in Attachment D of these Orders. The RD/RA Work Plan shall include a proposed schedule that includes a completion date for each task. If Ohio EPA determines that any additional or revised guidance documents affect the Work to be performed in implementing the RD/RA, Ohio EPA will notify Work Respondent, and the RD/RA Work Plan and other affected documents shall be modified accordingly.

iv. Handling any inconsistencies. Should Work Respondent identify any inconsistency between any of the laws and regulations and guidance documents that Work Respondent is required to follow by these Orders, Work Respondent shall notify Ohio EPA in writing of each inconsistency and the effect of the inconsistencies upon the Work to be performed. Work Respondent shall also recommend, along with a supportable rationale justifying each recommendation, the requirement that Work Respondent believes should be followed. Work Respondent shall implement the affected Work as directed in writing by Ohio EPA.

v. Review by Ohio EPA. Ohio EPA will review the RD/RA Work Plan and Supporting Documents pursuant to the procedures set forth in the Review of Submissions Section of these Orders.

vi. Implementation of the RD/RA Work Plan. Upon Ohio EPA's approval of the RD/RA Work Plan, Work Respondent shall implement the RD/RA Work Plan as approved. Work Respondent shall submit all plans, reports, or other deliverables required under the approved RD/RA Work Plan, in accordance with the approved Work Plan, for review and approval pursuant to the Review of Submissions Section.

E. Final Operation and Maintenance Plan

The Final O&M Plan, including a schedule for implementation, shall be submitted in accordance with the approved RD/RA Work Plan. Ohio EPA will review the Final O&M Plan pursuant to the procedures set forth in the Review of Submissions Section of these Orders. Upon approval of the Final O&M Plan by Ohio EPA, Work Respondent shall implement the Final O&M Plan. Work Respondent shall submit all plans, reports, or other deliverables required under the approved Final O&M Plan, in accordance with the approved Final O&M schedule set forth therein, for review and approval pursuant to the Review of Submissions Section of these Orders.

13. The 1986 Orders are amended to include an "ASSURANCE OF ABILITY TO COMPLETE WORK" Section that shall read as follows:

- A. Within thirty (30) days of the issuance of the Decision Document, unless otherwise specified in writing by Ohio EPA, Work Respondent shall establish and maintain financial security in the amount of the estimated cost of the operation and maintenance of the selected remedy identified in the Decision Document in order to ensure performance and completion of the Work under these Orders. The financial security shall be a financial assurance mechanism approved by Ohio EPA.

- B. Verification of the existence and adequacy of the approved financial assurance mechanism shall be submitted to the Ohio EPA annually by Work Respondent on the anniversary of the effective date of these Orders, or upon request of Ohio EPA. In the event that Ohio EPA determines at any time that the financial assurance mechanism provided pursuant to this Section is inadequate, Work Respondent shall, within thirty (30) days of receipt of notice of Ohio EPA's determination, obtain and present to Ohio EPA another financial assurance mechanism to be approved by Ohio EPA. The Work Respondent may change the form of the financial assurance mechanism provided under this Section at any time, upon notice and approval by Ohio EPA. Work Respondent's inability to demonstrate financial ability to complete the Work shall not excuse performance of any activities required under this Order.
- C. If Work Respondent can show that the estimated cost to complete the remaining Work has diminished below the financial security amount set forth in this Section, the Work Respondent may request that the amount of the financial security be reduced to the estimated cost of the remaining Work to be performed. This request for a reduction is available no more frequently than biannually. Information relied upon in calculating the revised estimate of costs must be provided with the request for reduction. A reduction in the amount of the financial security can only be made with the approval of Ohio EPA.

14. The 1986 Orders are amended to include a "**LAND USE AND CONVEYANCE OF TITLE**" section that reads as follows:

A. **Deed Notice**

- i. Within thirty (30) days after the effective date of these Orders, Respondent PCC Airfoils shall record with the County Recorder's Office for Stark County, Ohio, a deed notice for the real property owned by Respondent PCC Airfoils for the Site. Likewise, Respondent NGS&MSC shall record with the County Recorder's Office for Stark County, Ohio, a deed notice for the real property owned by Respondent NGS&MSC for the Site. The deed notice shall be consistent with the template attached as Attachment E and shall be approved by Ohio EPA. The deed notice shall reference the existence of these Orders and the need to contact the appropriate Respondent before any construction or excavation is undertaken at the Property. A copy of the recorded deed notice shall be submitted to Ohio EPA within thirty (30) days of recording the notice. Thereafter, if a Respondent conveys any interest in its Property included in the Site, each deed, title, or other instrument shall contain a notice stating that the Property is subject to these Orders and shall reference the

potential for any security, monitoring, treatment, or containment systems present on the Property as a result of these Orders. The Respondents shall record a new deed notice for the Property to reflect the subsequent construction of any security, monitoring, treatment or containment systems on their respective Properties.

- ii. To the extent that the Site, or any portion of the Site, is owned or controlled by persons other than either Respondent, Respondents shall use their best efforts to secure the filing of deed notices by said property owners for all the properties affected by the Contamination at the Site. The deed notices shall be consistent with the template attached as Attachment E and shall be approved by Ohio EPA. Copies of any deed notices filed for properties affected by the Contamination on, underlying or emanating from the Site shall be obtained by Respondents and provided to Ohio EPA upon request.

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B. Environmental Covenant

If the Decision Document selects a remedy requiring the filing of an Environmental Covenant, for their respective real properties, each Respondent shall, within thirty (30) days after issuance of the Decision Document, or after acquiring an interest in the Property, record with the Stark County Recorder's Office an Environmental Covenant for the Property that is part of the Site owned by each of the Respondents. The Environmental Covenant shall be consistent with the template attached hereto as Attachment F, shall be signed by Respondents, and shall be approved and signed by Ohio EPA. The Environmental Covenant must be recorded in the deed or official records of the County Recorder of Stark County, Ohio pursuant to R.C. 5301.82. The terms and conditions of the Environmental Covenant are incorporated into these Orders and shall be binding upon Respondents. Thereafter, if either Respondent conveys any interest in its Property included in the Site, each deed, title, or other instrument shall contain a notice stating that the Property is subject to these Orders and shall reference any monitoring, treatment, or containment systems present on the Property as a result of these Orders.

C. Proof of Filing Environmental Covenant

Within thirty (30) days after filing with the Stark County Recorder the executed Environmental Covenant, each Respondent shall certify to Ohio EPA that the Environmental Covenant for its Property has been filed for recording, and include with the certification a file and date-stamped copy of the recorded Environmental Covenant. Upon each conveyance by either Respondent of an interest in any portion of the Property, including but not limited to easements, deeds, leases and mortgages, Respondents shall include in the instrument of conveyance a restatement consistent

with paragraph 10 of the Environmental Covenant. The terms and conditions of the Environmental Covenant are hereby incorporated into these Orders and shall be binding upon the Respondents. If the Environmental Covenant is violated or breached by either Respondent, the Respondent causing the violation shall be in violation of these Orders.

D. Land Use Self-Reporting Requirement

Respondent PCC Airfoils for its Property and Respondent NGS&MSC for its Property shall ensure that no portion of their respective Properties at the Site will be used in any manner that would adversely affect the integrity of any security, containment, treatment, or monitoring systems at the Site. Respondent PCC Airfoils for its Property and Respondent NGS&MSC for its Property shall submit on an annual basis, written documentation verifying that any security, containment, treatment, or monitoring systems are in place and operational.

E. Notice of Transfer of Property

Prior to each conveyance by either Respondent of an interest in any portion of its Properties at the Site, including but not limited to easements, deeds, leases and mortgages, the conveying Respondent shall notify Transferee of the existence of the security, containment, treatment, or monitoring systems, and/or activity and use limitations, including environmental covenant(s) and shall provide a copy of these Orders to Transferee. The conveying Respondent shall notify Ohio EPA at least thirty (30) days in advance of each conveyance of an interest in any portion of the Site that is owned by such Respondent. The conveying Respondent's notice shall include the name and address of the Transferee and a description of the provisions made for the continued access to and maintenance of the security, containment, treatment, and monitoring systems.

F. Confirmation of Conveyance

Within thirty (30) days after each conveyance of an interest in any portion of the Site that is owned by the Respondents, the conveying Respondent shall submit to Ohio EPA, via certified mail, the following information:

- i. A copy of the deed or other documentation evidencing the conveyance;
- ii. The name, address, and telephone number of the new property owner and the name, address, and telephone number of the contact person for the Property owner;
- iii. A legal description of the Property, or the portion of the Property, being

transferred;

iv. A survey map of the Property, or the portion of the Property, being transferred; and

v. The closing date of the transfer of ownership of the Property, or portion of the Property.

15. The 1986 Orders are amended to include an **"ADDITIONAL WORK"** section that reads as follows:

A. Ohio EPA or Work Respondent may determine that in addition to the tasks defined in the approved RI/FS Work Plan and/or in the approved RD/RA Work Plan, additional Work may be necessary to accomplish the Objectives of the Parties as provided in the General Provisions Section of these Orders. Additional Work may also include, pursuant to applicable law, the implementation of interim actions to address substantial threats to human health or safety or the environment should such threats be identified during the conduct of the RI/FS and/or RD/RA

B. Within thirty (30) days of receipt of written notice from Ohio EPA that additional Work is necessary, unless otherwise specified in writing by Ohio EPA, Work Respondent shall submit a proposed addendum to the RI/FS Work Plan ("RI/FS Work Plan Addendum") and/or the RD/RA Work Plan ("RD/RA Work Plan Addendum") which contains (a) a work plan for the implementation of additional Work, (b) any revisions to the Supporting Documents and other RI/FS and/or RD/RA deliverable, as appropriate, (c) a schedule for performance of the additional Work, and (d) revisions to other schedules impacted by the additional Work, if any. If Work Respondent disputes the necessity of additional Work, Work Respondent shall initiate the procedures for dispute resolution set forth in the Dispute Resolution Section of these Orders within fourteen (14) days after receipt of Ohio EPA's notification of the need for additional Work. The RI/FS Work Plan Addendum and/or the RD/RA Addendum shall conform to the standards and requirements set forth in the documents attached to these Orders as Attachments A, B, and C (RI/FS SOW, RD/RA SOW and list of relevant guidance documents). Upon approval of the RI/FS Work Plan Addendum by Ohio EPA pursuant to the Review of Submissions Section of these Orders, Work Respondent shall implement the approved RI/FS Work Plan Addendum and/or the RD/RA Work Plan Addendum in accordance with the schedules contained therein.

C. If Work Respondent determines that additional Work is necessary, Work Respondent shall submit a proposal to Ohio EPA to explain what the additional Work is, why the additional Work is necessary, and what impact, if any, the additional Work will have on the RI/FS Work Plan and schedule and/or the RD/RA Work Plan and schedule. Ohio EPA will review the proposal for additional Work pursuant to the Review of

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Submissions Section of these Orders. If Ohio EPA concurs with the request to perform additional Work, Work Respondent shall submit a RI/FS Work Plan Addendum and/or RD/RA Work Plan Addendum, as described above, for the performance of additional Work. Any RI/FS Work Plan Addendum and/or RD/RA Work Plan Addendum shall conform to the standards and requirements set forth in the documents attached to these Orders as Attachments A, B, and C. Upon approval of the RI/FS Work Plan Addendum and/or the RD/RA Work Plan Addendum by Ohio EPA pursuant to the Review of Submissions Section of these Orders, Work Respondent shall implement the approved RI/FS Work Plan Addendum and/or the RD/RA Work Plan Addendum in accordance with the schedules contained therein. Additional Work does not include any activity performed in response to an emergency at the Site for which Work Respondent submits to Ohio EPA written notice of the performed activity.

16. The 1986 Orders are amended to include a **PROGRESS REPORTS AND NOTICE** section that reads as follows:

A. Unless otherwise directed by Ohio EPA, Work Respondent shall submit a written progress report to the Ohio EPA by the tenth (10) day of every month, unless an alternate schedule is agreed to by Ohio EPA. At a minimum, the progress reports shall include that information designated in Section 10 of the SOW. Monthly reports may not be used to propose modifications to approved plans; Work Respondent shall submit such requests to Ohio EPA in a separate written correspondence.

B. Progress reports (one copy only) shall be sent either by e-mail (Vicki.deppisch@epa.state.oh.us) or by U.S. Mail to the address listed below. All other documents (two copies) required to be submitted pursuant to these Orders to Ohio EPA shall be sent by U.S. mail to the following agency address(s):

Vicki Deppisch, Site Coordinator
Ohio EPA, Northeast District Office
2110 East Aurora Road
Twinsburg, Ohio 43207-3461

All written correspondence to Respondent PCC Airfoils shall be directed to:

Scotty Richmond
PCC Airfoils, LLC
3860 Union Ave., SE
Minerva, OH 44657

All written correspondence to Respondent NGS&MSC shall be directed to:

Joseph P. Kwan

Director's Findings and Orders for RI/FS and RD/RA
TRW Minerva Site

Corporate Director, Environmental Remediation
Northrop Grumman Corporation
1840 Century Park East
Los Angeles, CA 90067

A Party may designate an alternative contact name or address upon written notification to the other Parties and in accordance with the Designated Site Coordinators Section of these Orders, as applicable.

17. The 1986 Orders are amended to include a "**REVIEW OF SUBMISSIONS**" Section that reads as follows:

A. Ohio EPA shall review any work plan, report, or other item required to be submitted pursuant to these Orders.

B. Upon review, Ohio EPA may in its sole discretion: (a) approve the submission in whole or in part; (b) approve the submission with specified conditions; (c) modify or, modify and approve, the submission; (d) disapprove the submission in whole or in part; or (e) any combination of the above. The results of Ohio EPA's review shall be provided to Work Respondent in writing and shall identify any conditions, modifications and/or deficiencies. Excluded from the requirement to obtain Ohio EPA approval pursuant to this Section are the health and safety plan (HASP), progress reports, and the PER (which is subject to approval once incorporated into the RI/FS Work Plan.).

C. In the event that Ohio EPA approves an initial submission, Work Respondent shall proceed to take such action as required by Ohio EPA. In the event that Ohio EPA approves with condition or modification an initial submission, Work Respondent shall either (a) proceed to take such action as required by Ohio EPA, or (b) initiate the procedures for dispute resolution set forth in the Dispute Resolution Section of these Orders, within fourteen (14) days of receipt of Ohio EPA's written response to Work Respondent's submission. Work Respondent shall proceed to take any action required by an unmodified or unconditioned portion of the submission, as those portions are considered approved.

D. In the event that Ohio EPA disapproves an initial submission in whole or in part, and notifies Work Respondent in writing of the deficiencies, Work Respondent shall within fourteen (14) days, or such longer period of time as specified by Ohio EPA in writing, correct the deficiencies and submit the revised submission to Ohio EPA for approval. The revised submission shall incorporate all of the changes, additions, and/or deletions specified by Ohio EPA in its notice of disapproval. Revised submissions shall be accompanied by a letter indicating how and where each of Ohio EPA's comments was incorporated into the revised submission. To facilitate review of the revised submission, those portions of the document not affected by the Ohio EPA

comments should remain unchanged. The letter accompanying the submission should indicate, however, any indirect changes necessitated by Ohio EPA's comments.

E. To the extent that Work Respondent disputes any of Ohio EPA's changes, additions, and/or deletions to an initial submission, Work Respondent shall initiate the procedures for dispute resolution set forth in the Dispute Resolution Section of these Orders, within fourteen (14) days after receipt of Ohio EPA's notice of disapproval. Notwithstanding the disapproval, Work Respondent shall proceed to take any action required by a portion of the submission that is not specified as disapproved in the notice of disapproval.

F. In the event that Ohio EPA disapproves or modifies a revised submission, in whole or in part, and notifies Work Respondent in writing of the deficiencies or modifications, Work Respondent shall within fourteen (14) days, or such longer period of time as specified in writing by Ohio EPA, correct the deficiencies and incorporate all changes, additions, and/or deletions, and submit the revised submission to Ohio EPA for approval. If Work Respondent fails to submit a revised submission incorporating all changes, additions, modifications and/or deletions within fourteen (14) days, or such longer period of time as specified by Ohio EPA in writing, Work Respondent shall be considered in breach and/or violation of these Orders. If Work Respondent is in breach and/or violation of these Orders, Ohio EPA retains the right to terminate these Orders, perform any additional investigation, conduct a complete or partial Remedial Investigation or Feasibility Study, conduct a complete or partial Remedial Design or Remedial Action, and/or enforce the terms of these Orders as provided in the Reservation of Rights Section of these Orders.

G. All work plans, reports, or other items required to be submitted to Ohio EPA under these Orders shall, upon approval by Ohio EPA, be deemed to be incorporated in and made an enforceable part of these Orders. In the event that Ohio EPA approves a portion of a work plan, report, or other item, the approved portion shall be deemed to be incorporated in and made an enforceable part of these Orders.

18. The text in Section X of the 1986 Orders is wholly replaced and shall read as follows:

A. The Site Coordinators shall, whenever possible, operate by consensus.

B. In the event of a dispute regarding a disapproval, or an approval with condition(s) or modification(s) by Ohio EPA of a submission by Work Respondent, or a disagreement regarding the Work performed under these Orders, Work Respondent's Site Coordinator shall notify Ohio EPA's Site Coordinator in writing that Work Respondent wishes to invoke an informal dispute pursuant to this Section. The notification to invoke an informal dispute shall occur prior to the submission deadline.

C. The Parties shall have ten (10) days from the date written notice of the informal dispute is received by Ohio EPA's Site Coordinator to negotiate in good faith to resolve the dispute. This informal dispute resolution period may be extended by agreement of the Site Coordinators for up to twenty (20) additional days

D. In the event that the dispute is not resolved during the informal dispute resolution period, Work Respondent's Site Coordinator shall notify Ohio EPA's Site Coordinator in writing by the end of the informal dispute resolution period that Work Respondent wishes to invoke a formal dispute pursuant to this Section. This notice shall include a brief description of the item(s) in dispute. Within twenty (20) days of receipt of the written notice invoking the formal dispute resolution procedure, the Site Coordinators shall exchange written positions, including technical rationale supporting their positions. The Site Coordinators shall have ten (10) days from the date they have exchanged written positions to negotiate in good faith to resolve the formal dispute. This formal dispute period may be extended by agreement of the Site Coordinators for up to twenty (20) additional days.

E. In the event the dispute is not resolved in the formal dispute resolution period, Work Respondent's Site Coordinator shall notify Ohio EPA's Site Coordinator in writing by the end of the formal dispute resolution period whether Work Respondent wishes to submit final written positions to a DERR District Manager for review and resolution. The Site Coordinators shall have ten (10) days from the end of the formal dispute resolution period to submit their written positions. The DERR District Manager will resolve the dispute based upon and consistent with these Orders, the Objectives of the Parties contained in paragraph 8 of these Orders, the RI/FS SOW, RI/FS Work Plan, RD/RA SOW, RD/RA Work Plan, and other applicable federal and state laws and regulations. The decision of the DERR District Manager is considered final for the purposes of these Orders. Ohio EPA's position is that such a decision is not a final action as defined in ORC § 3745.04. Work Respondent's position is that such an action may be a final action as defined in ORC § 3745.04. Ohio EPA and Work Respondent agree that it is premature to raise and resolve the validity of such positions at this time.

F The pendency of a dispute under this Section shall extend only the time period for completion of the item(s) in dispute, except that upon mutual agreement of the Site Coordinators, any time period may be extended as is deemed appropriate under the circumstances. Such agreement shall not be unreasonably withheld by Ohio EPA. Elements of the Work not affected by the dispute shall be completed in accordance with the applicable schedules and time frames.

19. The 1986 Orders are amended to include an "**UNAVOIDABLE DELAYS**" section that shall read as follows:

A. Work Respondent shall cause all Work to be performed in accordance with applicable schedules and time frames set forth in these Orders or any approved work plan unless any such performance is prevented or delayed by an event that constitutes an unavoidable delay. For purposes of these Orders, an "unavoidable delay" shall mean an event beyond the control of Work Respondent that prevents or delays performance of any obligation required by these Orders and that could not be overcome by due diligence on the part of Work Respondent. Increased cost of compliance, among other circumstances, shall not be considered an event beyond the control of Work Respondent for the purposes of these Orders.

B. Work Respondent shall notify Ohio EPA in writing within ten (10) days after the occurrence of an event that Work Respondent contends is an unavoidable delay. Such written notification shall describe the anticipated length of the delay, the cause or causes of the delay, the measures taken and to be taken by Work Respondent to minimize the delay, and the timetable under which these measures will be implemented. Work Respondent shall have the burden of demonstrating that the event constitutes an unavoidable delay.

C. If Ohio EPA does not agree that the delay has been caused by an unavoidable delay, Ohio EPA will notify the Work Respondent in writing of that finding and of the noncompliance with these Orders. If Ohio EPA agrees that the delay is attributable to an unavoidable delay, Ohio EPA will notify Work Respondent in writing of the length of the extension for the performance of the obligations affected by the unavoidable delay.

20. The text in Section XII of the 1986 Orders is wholly replaced and shall read as follows:

A. Ohio EPA has incurred and continues to incur Response Costs in connection with the Site. Work Respondent shall reimburse Ohio EPA for all Response Costs incurred both prior to and after the effective date of these Orders.

B. Within thirty (30) days of the effective date of these Orders, Work Respondent shall remit a check to Ohio EPA in the amount of one hundred forty eight thousand, eight hundred fifty two dollars and twenty nine cents (\$148,852.29) for the Response Costs incurred on or before November 21, 2008 ("Past Response Costs") In the event that Work Respondent does not remit payment of Past Response Costs within sixty (60) days of the effective date of these Orders, Work Respondent shall remit payment for the unpaid balance and interest accrued on the unpaid balance. Interest shall accrue beginning thirty (30) days from the effective date of these Orders until the date payment is remitted and shall be calculated at the rate specified in ORC §5703.47(B) or any subsequent rate adjustments.

C. For Response Costs incurred after November 21, 2008, Ohio EPA will submit to

Work Respondent on an annual basis an itemized invoice of its Response Costs for the previous year. Within thirty (30) days of receipt of such itemized invoice, Work Respondent shall remit payment for all of Ohio EPA's Response Costs for the previous year. To the extent Work Respondent disputes the accuracy of the State of Ohio's request for reimbursement, including whether the costs are Response Costs as defined in these Orders, or whether costs are inconsistent with the NCP, Work Respondent shall initiate the formal dispute provisions of the Dispute Resolution Section within fourteen (14) days after receipt of Ohio EPA's request for reimbursement of costs. Should Work Respondent dispute a portion of the Response Costs set forth in an itemized statement, but not all of the costs, Work Respondent shall timely pay the uncontested portion pursuant to the provisions of the Reimbursement of Costs Section of these Orders. In the event that Work Respondent does not remit payment of Response Costs within sixty (60) days after receipt of such invoice, Work Respondent shall remit payment for the unpaid balance and interest accrued on the unpaid balance. Interest shall accrue beginning thirty (30) days from the date of the invoice until the date payment is remitted and shall be calculated at the rate specified in ORC §5703.47(B) or any subsequent rate adjustments.

D. Work Respondent shall remit payments to Ohio EPA pursuant to this Section as follows:

- i. Payment shall be made by bank check payable to "Treasurer, State of Ohio/Hazardous Waste Special Cleanup Account" and shall be forwarded to Office of Fiscal Administration, Attn: Brenda Case, Ohio EPA, Lazarus Government Center, P.O. Box 1049, Columbus, Ohio 43216-1049;
- ii. A copy of the transmittal letter and check shall be sent to the Fiscal Officer, DERR, Ohio EPA, P.O. Box 1049, Columbus, Ohio 43216-1049, and to the Site Coordinator; and
- iii. Each payment shall identify the name and address of the party making payment, the Site name, and Ohio EPA's revenue number identified on the associated invoice.

21. The 1986 Orders are amended to include a "**PERIODIC REVIEW**" section that shall read as follows:

A. Work Respondent shall conduct studies and investigations as requested by Ohio EPA in order to permit Ohio EPA to conduct reviews as to the effectiveness of the Remedial Action at least every five (5) years as described in section 121(c) of CERCLA and any applicable regulations.

B. If Ohio EPA determines that information received, in whole or in part, during a

review conducted pursuant to the Periodic Review Section of these Orders indicates that the Remedial Action is not protective of public health and safety and the environment, the Work Respondent shall undertake any further response actions Ohio EPA has determined are appropriate. Work Respondent shall submit a plan for such work to Ohio EPA for approval in accordance with the procedures set forth in the Review of Submittals Section of these Orders, within thirty (30) days of receiving a request from Ohio EPA to submit such a work plan.

C. Work Respondent may invoke the procedures in the Dispute Resolution Section to dispute (1) Ohio EPA's determination that the Remedial Action is not protective of public health and safety and the environment, or (2) Ohio EPA's selection of further response actions as unlawful or unreasonable.

22. Section XV of the 1986 Orders is replaced in its entirety and shall be entitled "Modifications" and shall read as follows:

These Orders may be modified by agreement of the Parties. Modifications shall be in writing, signed by the authorized representative of each of the Respondents, and by the Director, and shall be effective on the date entered in the Journal of the Director of Ohio EPA.

23. The text in Section XIV of the 1986 Orders is amended to read as follows:

Respondents agree to indemnify and save and hold Ohio EPA harmless from any and all claims or causes of action arising from or on account of acts or omissions of Respondents, their officers, employees, receivers, trustees, agents, or assigns. Ohio EPA shall not be considered a party to and shall not be held liable under any contract entered into by Respondents in carrying out the activities pursuant to these Orders. Consistent with federal, state, and common laws, nothing in this Order shall render Respondents liable for any act or omission of Ohio EPA related to the Site if said act is negligent, performed outside the scope of employment or official responsibilities, or performed with malicious purpose, in bad faith, or in a wanton or reckless manner.

24. The text in Section XIII in the 1986 Orders is amended to read as follows:

Nothing herein shall constitute or be construed as a release from any claim, cause of action, or demand in law or equity against any person, firm, partnership, or corporation not a Party to these Orders, for any liability arising from, or related to, events or conditions at the Site.

25. The text in Section XI of the 1986 Orders is amended to read as follows:

Nothing herein shall waive Ohio EPA's right to seek legal and/or equitable relief to

enforce this Consent Order, including penalties against Respondents for noncompliance with these Orders, under Section 106(b) of CERCLA and Chapter 3734, 3745 and 6111 of the Ohio Revised Code. Nothing herein shall waive Ohio EPA's right to take any action authorized by Ohio Revised Code Sections 3734.20 through 3734.26 or Section 107 of CERCLA or any other law.

Ohio EPA reserves the right to terminate these Orders and/or perform all or any portion of the Work or any other measures in the event that the requirements of these Orders are not wholly complied with within the time frames required by these Orders.

Ohio EPA reserves the right to take any action, including but not limited to any enforcement action, action to recover costs, or action to recover damages to natural resources, pursuant to any available legal authority as a result of past, present, or future violations of state or federal laws or regulations or the common law, and/or as a result of events or conditions arising from, or related to, the Site. Upon termination pursuant to the Termination Section of these Orders, Respondents shall have resolved their liability to Ohio EPA only for the Work performed pursuant to these Orders.

26. The text in Section XVII of the 1986 Orders is replaced in its entirety and shall read as follows:

Work Respondents' obligations under these Orders shall terminate upon Ohio EPA's approval in writing of Work Respondent's written certification to Ohio EPA that all Work required to be performed under these Orders including payment of Response Costs has been completed. The Work Respondent's certification shall contain the following attestation: "I certify that the information contained in or accompanying this certification is true, accurate, and complete." This certification shall be submitted by Work Respondent to Ohio EPA and shall be signed by a responsible official of Work Respondent. The termination of Work Respondent's obligations under these Orders shall not terminate the Respondents' obligations under the Reservation of Rights, Access to Information, Indemnity, Other Claims and Land Use and Conveyance of Title Sections of these Orders.

27. The 1986 Orders are amended to include a "**WAIVER AND AGREEMENT**" section that shall read as follows:

A. In order to resolve disputed claims, without admission of fact, violation, or liability, Respondents consent to the issuance of these Orders, and agree to comply with these Orders.

B. Respondents hereby waive the right to appeal the issuance, terms and conditions, and service of these Orders and Respondents hereby waive any and all rights that they may have to seek administrative or judicial review of these Orders either

Director's Findings and Orders for RI/FS and RD/RA
TRW Minerva Site

in law or equity except as provided herein.

C. Notwithstanding the limitations herein on Respondents' right to appeal or seek administrative or judicial review, Ohio EPA and Respondents agree if these Orders are appealed by any other party to the Environmental Review Appeals Commission, or any court, Respondents retain the right to intervene and participate in such appeal. In such event, Respondents shall continue to comply with these Orders notwithstanding such appeal and intervention unless these Orders are stayed, vacated or modified.


28. With the exception of the approved amendments to the 1986 Orders, as set forth in the Orders Section of these Orders, the 1986 Orders remain unchanged and in full force and effect.

29. The effective date of these Orders shall be the date these Orders are entered in the Journal of the Director of Ohio EPA.

30. Each undersigned representative of a Party to these Orders certifies that he or she is fully authorized to enter into these Orders and to legally bind such Party to these Orders.

IT IS SO ORDERED AND AGREED:

OHIO ENVIRONMENTAL PROTECTION AGENCY


Chris Korleski, Director
Ohio Environmental Protection Agency

1/14/09
Date

Director's Findings and Orders for RI/FS and RD/RA
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IT IS SO AGREED:

NORTHROP GRUMMAN SPACE & MISSION SYSTEMS CORP.

BY:

Name

Date

Vice President - Administrative Services
Title

12-22-2008

Director's Findings and Orders for RI/FS and RD/RA
TRW Minerva Site

PCC AIRFOILS, LLC

BY: John Sobada

Name

12-30-08
Date

V.P. Finance & Admin
Title

Data Gap Letter Form
TRW Minerva Site

Please sign and mail a copy with an original signature to:

Ann M. Fischbein, Staff Attorney
Ohio EPA, Office of Legal Services
P.O. Box 1049
Columbus, Ohio 43216-1049

**DATA GAP LETTER - ACKNOWLEDGMENT OF AGREEMENT REGARDING
DATA GAPS/GENERAL TASKS AT THE TRW MINERVA SITE**

Ohio EPA has identified the following data gaps/general tasks ("Data Gaps") regarding the former TRW Inc./TRW Minerva Facility, Stark County, Ohio:

1. Data review and analysis and sampling:
 - Review and evaluate all current monitoring well analytical data, identify data gaps, develop a comprehensive sampling plan based on the data gaps identified, and conduct targeted sampling of wells in accordance with the comprehensive sampling plan.
 - Evaluate all current data regarding the ground water model and capture zone for the pump and treat system.
 - Evaluate the compliance point wells.
2. Identify, evaluate and resolve all remaining issues regarding the residential wells, including any remaining residential use.
3. Complete human health and ecological risk assessments.
4. Evaluate on-Site and off-Site vapor intrusion issues.
5. Determine the rate and extent of contamination for the barn and central areas.

Northrop Grumman Space & Mission Systems Corp. ("NGS&MSC") does hereby agree with the Data Gaps listed herein.

Data Gap Letter Form
TRW Minerva Site

The undersigned representative of NGS&MSC certifies that he or she is fully authorized to sign this Acknowledgment of Agreement.

IT IS SO AGREED:

NORTHROP GRUMMAN SPACE & MISSION SYSTEMS CORP.

BY:



Name JOSEPH P. KWAN
CORPORATE DIRECTOR
ENVIRONMENTAL REMEDIATION

Title

12/22/2008
Date

Generic Statement of Work for Conducting Remedial Investigations and Feasibility Studies

**Ohio EPA
Division of Emergency and Remedial Response
Remedial Response Program**

September 1, 2006

**Generic Statement of Work
for Conducting
Remedial Investigations and Feasibility Studies**

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GENERIC STATEMENT OF WORK REMEDIAL INVESTIGATION/FEASIBILITY STUDY

Purpose:

This Statement of Work (SOW) sets forth the generic requirements for conducting a Remedial Investigation and Feasibility Study (RI/FS) of the Site. The purpose of the RI is to characterize the nature and extent of any releases or potential releases of contaminants at or from the Site, assess potential risks to human health and the environment posed by such releases, and collect the information needed to support the development and evaluation of remedial alternatives. The purpose of the FS is to develop and evaluate remedial alternatives to provide the Ohio Environmental Protection Agency (Ohio EPA) with the information needed to select a site remedy. The RI and FS are conducted in an iterative manner to allow the information gathered during the RI to influence the development of remedial alternatives, which in turn affects data needs and the scope of the RI.

The RI/FS shall be performed in accordance with the requirements of the consensual Director's Final Findings and Orders for the Site, referred to herein as "Orders", and this SOW, and in a manner consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Final Rule (40 CFR Part 300). Respondent shall refer to U.S. EPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA/540/G-89/004, October 1988) (U.S. EPA RI/FS Guidance) and other guidance that the Ohio EPA may use in conducting an RI/FS. A partial list of guidance is included as the Guidance List attached to the Orders. Sections of relevant guidance which further describe the RI/FS tasks are referenced throughout this SOW and appendices. Respondent shall furnish all personnel, materials, and services needed or incidental to performing the RI/FS except as otherwise specified in the Orders.

At the completion of the RI/FS, Ohio EPA shall be responsible for the selection of a site remedy and shall memorialize the selected remedy in a Decision Document. The site remedy selected by Ohio EPA shall be protective of human health and the environment, comply with applicable or relevant and appropriate requirements of federal and state environmental laws and regulations (ARARs), be cost-effective, utilize permanent solutions and treatment technologies or resource recovery technologies to the maximum extent practicable, and address the preference for treatment as a principal element. The final RI and FS Reports, as approved by Ohio EPA, shall, with the administrative record, form the basis for selection of the site remedy and provide the information needed to support development of a Decision Document.

Ohio EPA shall provide oversight of Respondent's activities throughout the RI/FS, including field activities. Respondent shall support Ohio EPA's conduct of oversight activities.

Section 1 - RI/FS Project Scoping

Scoping the RI/FS

Scoping is the planning process for the RI/FS. Ohio EPA developed and included in the Orders a general management approach for the Site and preliminary remedial action objectives (RAOs) for the RI/FS. Consistent with the general management approach and preliminary RAOs, and in consultation with Ohio EPA, Respondent shall plan the specific project scope and prepare and submit for review and comment a Pre-investigation Evaluation Report (PER).

Respondent shall document in the PER the performance and results of the scoping tasks identified in this Section 1 and Appendix A of this SOW, thus establishing the framework for subsequent development of the RI/FS Work Plan. Respondent shall address in the PER each RI/FS SOW task by one of the following three methods: 1) indicating that the task has already been performed and providing the results of the task and supporting documentation; 2) indicating that the task is not relevant to the Site and providing the technical justification for omitting the task; or 3) indicating that the task is relevant to the Site and will be addressed in the RI/FS Work Plan.

Respondent shall include in the PER a Level 1 Scoping Ecological Risk Assessment (ERA) meeting the requirements outlined in Appendix I of this SOW and the Ohio EPA Division of Emergency and Remedial Response (DERR) *Ecological Risk Assessment Guidance Document*, February, 2003 (DERR ECO Guidance). Respondent shall also include an annotated bibliography of existing reports relevant to the RI/FS. Upon request, Respondent shall provide copies of the reports to Ohio EPA

Scoping is continued, repeated as necessary, and refined throughout the RI/FS process as data become available. Appendix A of this SOW summarizes the RI/FS project scoping requirements and provides the format for the PER.

1.1 Project Initiation Meeting and Site Visit

Respondent shall contact Ohio EPA's Site Coordinator to set up a Project Initiation Meeting, which is to be held prior to Respondent's submittal of the PER. The purpose of the meeting is to afford Respondent and Respondent's contractors an opportunity to review with Ohio EPA the technical requirements of the Orders and this SOW and seek

clarification regarding the performance of the required work and/or preparation of deliverables, and to establish a date for a site visit as discussed in A. 2. of Appendix A of this SOW. Topics of discussion may include, but need not be limited to, the site management strategy, preliminary RAOs, data quality objectives (DQOs), preparation of the baseline human health risk assessment (HHRA), ERA, initiation and/or integration of emergency or interim actions, involvement and coordination with other Ohio EPA programs and other agencies, community relations activities, performance of the FS, and communication between Respondent and Ohio EPA. The meeting will be attended by Ohio EPA's Site Coordinator and agency staff providing support to the Site Coordinator in overseeing Respondent's conduct of the RI/FS. Ohio EPA also encourages meeting attendance by those persons providing support to Respondent.

Section 2.0 - RI/FS Work Plan and Supporting Documents

RI/FS Work Plan (U.S. EPA RI/FS Guidance Section 2.3.1)

Following receipt of Ohio EPA's comments on the PER, Respondent shall prepare and submit for review and approval an RI/FS Work Plan and supporting documents, including a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP). A Health and Safety Plan (HASP) shall also be submitted, but for review and comment only. Respondent shall incorporate the PER, revised in accordance with Ohio EPA's comments, into the RI/FS Work Plan to document the initial RI/FS scoping activities.

The RI/FS Work Plan shall detail the methods and procedures for performing the remaining RI/FS tasks (Sections 3 through 10 of this SOW) and shall be developed in conjunction with the FSP, QAPP, and HASP although each may be delivered under separate cover. The RI/FS Work Plan and supporting documents shall provide a detailed description of the tasks to be performed, the technical rationale for performing the work in the manner proposed, the information needed for each task, the information to be produced during and at the conclusion of each task, and a description of the work products that will be submitted to Ohio EPA. This includes the deliverables set forth in the Orders and this SOW, including Interim Technical Memoranda produced during the field investigation and at the conclusion of each major phase of the RI/FS and meetings and presentations to Ohio EPA.

If Respondent intends to rely on modeling to satisfy any RI/FS task, Respondent shall identify the models Respondent proposes to use and, in a manner consistent with U.S. EPA's *Guidance for Quality Assurance Plans for Modeling*, EPA QA/G-5M, fully explain their application in the RI/FS Work Plan and supporting documents, including model assumptions and operating conditions, input parameters, and verification and calibration procedures. If Respondent identifies the need to conduct modeling following approval

of the RI/FS Work Plan, Respondent shall submit for review and approval an addendum to the RI/FS Work Plan.

The RI/FS Work Plan shall reflect coordination with any identified treatability study requirements (Section 8 and Appendix L of this SOW) and shall include a process for refining and/or identifying additional ARARs and to be considered (TBC) criteria, conducting the HHRA and ERA, refining the conceptual site model (CSM), and submitting monthly progress reports and ITMs to Ohio EPA. The RI/FS Work Plan shall include a comprehensive RI/FS project schedule indicating critical path dependencies and including dates for the initiation, duration, and completion of each RI/FS task. The schedule shall also include field work and development and submittal of required deliverables. The RI/FS Work Plan, FSP, and QAPP must be approved by Ohio EPA prior to the initiation of field activities.

Due to the potentially unknown nature of the Site and the iterative nature of the RI/FS, additional RI/FS tasks may be identified following approval of the RI/FS Work Plan. Ohio EPA may require or Respondent may propose additional RI/FS tasks in accordance with the provisions of the Additional Work Section of the Orders.

2.1 Field Sampling Plan

Respondent shall submit for review and approval a FSP describing the field activities to be performed and defining the procedures and methods that must be used to collect field measurements and samples. Activities and procedures include collection of geophysical data, drilling of soil borings, installation of ground water monitoring wells, collection of multimedia samples, field control samples, and any field measurements. The FSP shall also address sample packaging and shipping requirements, proper testing, handling and disposal of investigation-derived wastes, field documentation procedures, and corrective action procedures.

The FSP shall detail the methods and procedures for each field activity. A field activity includes any task which involves the collection of environmental media or data. The FSP shall discuss the purpose of each task and how it will fulfill the DQOs provided in the associated QAPP. Respondent shall prepare the FSP in a manner consistent with Sections 3.3.4.1 through 3.3.4.12 of the U.S. Army Corps of Engineers' guidance *Requirements for the Preparation of Sampling and Analysis Plans*, EM 200-1-3, February, 2001, using the FSP outline provided in Appendix B of this SOW.

2.2 Quality Assurance Project Plan

Respondent shall submit for review and approval a site-specific QAPP. The QAPP shall address all relevant elements of U. S. EPA's *Guidance for Quality Assurance Project*

Plans, QA-G-5, EPA/240/R-02-009, December 2002, including DQOs developed in a manner consistent with the DQO guidance identified in the Guidance List attached to the Orders. Some QAPP elements may already be provided in the FSP, in which case, Respondent shall clearly cross-reference in the QAPP to the section and page number in the FSP where such information may be located. See Appendix C of this SOW for the QAPP elements included in the referenced U.S. EPA guidance.

Respondent shall include an electronic version of the laboratory(ies) QAPP on disc in PDF format. Upon request, Respondent shall provide to Ohio EPA any other records, documents, or other information generated or stored by the laboratory(ies) as a result of the work Respondent is required to perform by the Orders or this SOW.

2.3 Health and Safety Plan (U.S. EPA RI/FS Guidance Section 2.3.3)

Respondent shall submit for review and comment a HASP that complies with the Occupational Safety and Health Administration (OSHA) regulations and protocols outlined in Title 29 CFR, Part 1910 or as OSHA may otherwise require. See Appendix D of this SOW for the major elements of a HASP. Further, the HASP shall include all other monitoring, procedures, and protocols needed to protect the health and safety of those persons conducting site activities, visiting the Site, and residing or working in the surrounding community.

Section 3 - Site Characterization

Site Investigation

Respondent shall conduct such investigations as necessary to obtain data of sufficient quality and quantity to support the RI/FS. All sampling, analyses, and measurements shall be conducted in accordance with the approved QAPP and FSP. All sampling and measurement locations shall be documented in a project-specific field log and identified on site maps.

3.1. Environmental Setting

Respondent shall collect information to supplement and verify existing information on the environmental setting of the Site and surrounding the Site. Characterization of the environmental setting shall include but not be limited to regional hydrogeology, site hydrogeology, subsurface soil and rock units, surface soils, surface water and sediment, land use, land cover, and local climate. Appendix E of this SOW summarizes the requirements for characterizing the environmental setting at the Site.

3.1.1. Source Characterization

Respondent shall conduct an investigation to locate and characterize any known or potential source(s) of contaminant releases at the Site, including areas where wastes have been placed, collected, come to be located or removed. Methods for source characterization shall include but not be limited to test pits, trenches, and/or borings to characterize buried source areas; determine source area depth, thickness, and volume; and identify and investigate the integrity of any existing natural or engineered containment that may be present. Geophysical characterization methods, such as ground penetrating radar, magnetometry, tomography, or other electromagnetic methods shall be used as appropriate to assist in delineation and characterization of potential contaminant source areas. The source area investigation shall also include, as appropriate, leaching tests and/or modeling to assess the potential leaching of contaminants from source areas, and ground water investigations where potential source areas may exist in a saturated zone. Appendix F of this SOW summarizes the requirements for conducting the source characterization.

3.1.2. Nature and Extent of Contamination

Respondent shall collect analytical data to determine the nature and extent of contamination in all potentially affected media at the Site (see Section 3.2.4 of the U.S. EPA RI/FS Guidance). Data collected shall be sufficient to support determination of the origin, extent, direction, and rate of movement of contaminants. Data shall also be collected to support determination of background concentrations for contaminants in accordance with the background guidance identified in the Guidance List attached to the Orders. Respondent shall collect the data in accordance with the approved RI/FS Work Plan and shall document the methods and procedures used during the investigation in the RI Report. Appendix G of this SOW summarizes the requirements for determining the nature and extent of contamination at the Site.

Section 4 - Risk Assessment

Risk assessment is the process used to evaluate current and reasonably anticipated future site conditions in an effort to quantify risks or hazards to human health and the environment in the absence of any remedial action. Respondent shall collect all data necessary to support the assessments, and include the assessments in the RI Report.

4.1 Risk Assessment Assumptions Document

Respondent shall submit for review and approval a Risk Assessment Assumptions Document (RAAD) prior to performing the HHRA. The RAAD shall provide all

assumptions, inputs, and supporting information required to complete the assessment, including:

- a) refined CSM;
- b) all current and reasonably anticipated receptors to be evaluated;
- c) all exposure scenarios to be evaluated;
- d) all exposure media to be evaluated;
- e) all screening values and sources for values used in the reduction of the contaminants of potential concern (toxicity-based and/or background). Respondent shall derive background concentrations in accordance with the background guidance, and shall include the methods and data used;
- f) list of all contaminants of potential concern per medium;
- g) all risk assessment exposure assumptions needed to complete the HHRA;
- h) all exposure point concentrations and the supporting equations; and,
- i) methods and input values that Respondent proposes to use to evaluate specific contaminants, such as lead, or environments, such as surface waters or wetlands.

Following Ohio EPA approval of the RAAD, Respondent shall prepare the HHRA in accordance with the approved RAAD.

4.2 Human Health Risk Assessment

Respondent shall prepare a baseline HHRA which evaluates current and potential future threats to human health in the absence of any remedial action. The HHRA shall focus on current and reasonably anticipated future risks or hazards to persons coming into contact with site-related contaminants or environmental media containing one or more contaminants (e.g., ground water, soils, sediments, surface water, air, subsurface gases, contaminated organisms).

The HHRA relies upon information gathered at the Site. Respondent shall ensure that the site investigations and resultant data are sufficient in both quality (e.g., DQOs, sample detection limits, quality assurance procedures) and quantity to fully describe the current and potential future threats to human health. Respondent shall plan and

conduct the HHRA in manner consistent with U.S. EPA's *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A)* EPA/540/1-89/002 (RAGS, Part A, 1989) and other relevant state and federal guidance as identified in this SOW and the Guidance List attached to the Orders.

The HHRA shall organize and present the results and data from all site investigations such that relationships between and among environmental media and receptors are clear (see Exhibit 9-1 in RAGS Part A for a suggested outline for the baseline risk assessment report; RAGS Part D may also be followed for a suggested format). The HHRA shall project the potential risk of health problems occurring if no cleanup action is taken at the Site and identify areas and media where risks exceed a cumulative excess lifetime cancer risk of $1E-5$ and/or a hazard index of 1. Appendix H of this SOW summarizes the requirements for conducting the baseline HHRA.

4.3 Ecological Risk Assessment

Respondent shall prepare an ERA which evaluates current or potential future adverse effects in the absence of any remedial action to flora and fauna at the population, community, ecosystem, and/or individual level as appropriate. The ERA shall be conducted in a manner consistent with the DERR ECO Guidance, U.S. EPA's guidance as referenced therein, and other relevant guidance as identified in the Guidance List attached to the Orders.

The ERA is generally conducted in an iterative or phased approach as data are gathered during the RI and decisions are made regarding the need, or lack thereof, for more comprehensive ecological assessment. Respondent shall conduct a Level I Scoping ERA during the preparation of the PER discussed in Section 1 and Appendix A of this SOW, and include the Level I ERA Report in the PER. If a Level II Screening ERA is needed, Respondent shall describe in detail the tasks necessary to complete the Level II ERA in the RI/FS Work Plan and supporting documents, and include a date for submittal of the Level II ERA Report in the RI/FS project schedule. If during the RI it is determined that additional ecological assessment is needed, Respondent shall, as necessary, submit addendum(s) to the RI/FS Work Plan and supporting documents detailing the tasks necessary to complete each subsequent level of assessment, including a revised RI/FS project schedule with dates for related deliverables. Respondent shall submit an ERA Report for review and approval at the conclusion of each level of the ERA. The ERA Report shall summarize the methodology and results of the assessment, include a recommendation and supporting rationale regarding the need for additional assessment, and provide all data and other site-specific information Respondent relied upon in conducting the assessment. The final ERA Report shall also provide all information necessary to evaluate the environmental impact of proposed

remedial alternatives in the FS. Appendix I of this SOW summarizes the requirements for conducting the ERA.

Section 5 - Site-Specific Preliminary Remediation Goals

Following the completion of the HHRA and the final level of ERA, Respondent shall revisit the preliminary remediation goals (PRGs) initially identified in the PER and develop site-specific PRGs for inclusion in the RI Report. Site-specific PRGs are interim remediation goals generally developed on a media specific basis to assist with risk management and engineering considerations during the development and screening of remedial alternatives (see Section 7.0 below). They do not consider potential cross-media exposures, and therefore, may not account for all exposures a given receptor may potentially experience at a Site absent remediation.

Site-specific PRGs are generally calculated by rearranging the risk assessment equations to derive single chemical, single pathway remediation goals based on a hazard quotient (HQ) of 1 or an excess lifetime cancer risk of $1E-5$ for receptors identified to be at risk due to actual or potential site-related exposures. Site-specific PRGs for protection of human health are then adjusted as necessary to account for multiple chemical and/or multiple routes of exposures within a given medium (e.g., soil, ground water, air) so as not to exceed a cumulative $1E-5$ excess lifetime cancer risk and a hazard index (HI) as appropriate, of 1 for the same receptor population.

Site-specific PRGs for potential ecological hazards are derived in the same manner using an HQ or HI of 1 as appropriate, or other appropriate ecological evaluation (e.g., toxicity test, bioassay, biosurvey, water quality standard, or screening value). Where site-specific ecological PRGs are developed based on multiple receptors, it may be possible to reduce the list of PRGs by selecting the lowest PRG for a given chemical/receptor combination.

Adjustment of PRGs for the protection of human health to account for possible exposures to multiple chemicals and/or multiple routes of exposure is site-specific and dependent on the exposures and associated risks at the Site. Generally, PRGs are calculated for each chemical that individually exceeds or significantly contributes to risk above the cumulative excess lifetime cancer risk of $1E-5$ and the non-cancer HI of 1. Adjustment of the PRGs based on a cancer disease endpoint to account for multiple chemical exposures is completed by dividing each PRG by the total number of chemicals of concern. For PRGs based on a non-cancer disease endpoint, the same procedure is followed. However for PRGs based on non-cancer effects, adjustments or groupings may be made to account for specific toxicological effects of the chemical contaminants. These groups and considerations should be consistent with those used

in the baseline risk assessment. See Section 2.8 of RAGS, Part B for additional information on development of site-specific PRGs.

Some site-specific PRGs may depend on Contaminant and/or site-specific circumstances, such as PRGs for lead, or leach-based values for soils or wastes for the protection of ground and surface waters. PRGs may also be based on background concentrations where the use of background concentrations is determined to be appropriate based on the guidance included in the Guidance List attached to the Orders. These PRGs are stand-alone values and are not generally adjusted to account for exposure to multiple contaminants.

Further adjustment of the site-specific PRGs is dependent on the risk management approach and configuration of each of the remedial alternatives subjected to detailed analysis in the FS. This analysis may include the concept of driver chemicals and other specific attributes of the Site and or contamination. Each alternative must be able to maintain protection of human health and the environment during implementation and achieve a residual site-wide cumulative excess lifetime cancer risk of $1E-5$ and a non-cancer HI of 1 following implementation. Final remediation goals are determined by Ohio EPA as part of the remedy selection process and are not part of the AOC or this SOW. See Chapter 2 of RAGS, Part C for additional information on the risk evaluation of remedial alternatives.

Section 6 - Remedial Investigation Report

RI Report

Respondent shall submit for Ohio EPA review and approval a RI Report detailing the methods and results of the remedial investigation and the risk assessments. The format for the RI Report is provided in Appendix J of this SOW.

Section 7 - Alternatives Array Development

Developing and Screening of Remedial Alternatives (U.S. EPA RI/FS Guidance Chapter 4)

Respondent shall begin to develop and evaluate a range of remedial alternatives during RI/FS scoping (Section 1.0 and Appendix A of this SOW; Section 2.2.3 of the U.S. EPA RI/FS Guidance). Respondent shall continue to develop and evaluate the remedial alternatives initially developed during project scoping as RI data become available. With the exception of the "no action" alternative, all alternatives under consideration

must, at a minimum, ensure protection of human health and the environment and comply with the applicable or relevant and appropriate requirements of state and federal laws and regulations.

7.1 Refine Remedial Action Objectives (U.S. EPA RI/FS Guidance Section 4 2.1)

Respondent shall further refine the preliminary RAOs identified during project scoping. RAOs for protection of human health should specify a site-specific PRG, an exposure pathway and receptor, and preliminary points of compliance. RAOs for protecting environmental receptors should seek to preserve or restore a resource (e.g., as ground water) and should be expressed in terms of the medium of interest and target remediation goals whenever possible (see U.S. EPA's RI/FS Guidance, Table 4-1). The refined RAOs shall be based on the results of the RI and the risk assessments, and shall be consistent with Section 300.430 of the NCP. Respondent shall prepare and submit for review an ITM identifying the refined RAOs for protection of human health and the environment and detailing the methods and procedures used to refine them. Respondent shall revise the refined RAOs per Ohio EPA's comments, if any, and include the refined RAOs in the Alternatives Array Document described in 7.2 below.

7.2 Alternatives Array Document (U.S. EPA RI/FS Guidance Chapter 4)

Respondent shall prepare an Alternatives Array Document (AAD) which documents the methods, rationale, and results of the technology, process option, and alternatives development and the screening process. Respondent shall include an evaluation of whether the amount and type of data existing for the Site will support the subsequent detailed analysis of the alternatives. Respondent shall modify the alternatives based on Ohio EPA's comments, if any, to assure identification of an appropriate range of viable alternatives for consideration in the detailed analysis. The AAD, as revised by Respondent to incorporate Ohio EPA comments, shall be combined with the detailed analysis of alternatives to form the FS Report described in Section 9 and Appendix M of this SOW. Appendix K of this SOW summarizes the requirements for conducting the alternatives screening process and provides the required contents of the AAD.

Section 8 - Treatability Studies

Determining the Need for Treatability Studies

Treatability studies are laboratory or field tests designed to provide critical data needed to evaluate one or more treatment technologies. These studies generally involve characterizing untreated waste and evaluating the performance of the technology under different operating conditions. These results may be qualitative or quantitative,

depending on the level of treatability testing. Treatability studies conducted during the RI/FS to support remedy selection are generally used to determine whether the technology can achieve the RAOs and to provide information needed to support the detailed analysis of alternatives in the FS.

Potential remedial technologies and associated treatability study needs are initially evaluated by Respondent during RI/FS scoping activities (Section 1 and Appendix A of this SOW). Due to the iterative nature of the scoping process throughout the conduct of the RI/FS, potential remedial technologies and the need for treatability studies may be reevaluated as data from the RI becomes available. Regardless of when a potential remedial technology is identified, it is incumbent upon Respondent to identify the need for treatability studies as early in the RI/FS process as possible such that treatability studies are substantially completed prior to performing the detailed analysis of alternatives (Section 9 of this SOW). Ohio EPA may also identify the need for treatability studies during the course of the RI/FS and communicate that need to Respondent. Respondent shall conduct treatability studies in a systematic fashion to ensure that the data generated can support the detailed analysis of alternatives during the FS.

Should the need for treatability studies be identified, Respondent shall submit to Ohio EPA a Treatability Study Work Plan for review and approval. Appendix L of this SOW summarizes the requirements for treatability studies.

Section 9 - Feasibility Study Report

Detailed Analysis of Alternatives

Once it has been determined that sufficient data exist to proceed, Respondent shall conduct a detailed analysis of the alternatives surviving the screening process to provide Ohio EPA with the information needed for selection of a site remedy. The detailed analysis shall consist of an individual analysis of each alternative against eight evaluation criteria followed by a comparative analysis of the alternatives using the same evaluation criteria as the basis for comparison.

9.1 Feasibility Study Report (U.S. EPA RI/FS Guidance Section 6.5)

Respondent shall prepare and submit a FS Report for review and approval. The AAD, revised based on comments received from Ohio EPA, shall be incorporated into the FS as it is prepared. Respondent will refer to Table 6-5 of the U.S. EPA RI/FS Guidance for an outline of the FS Report format and required report content. Appendix M of this

SOW summarizes the process and criteria for conducting the detailed analysis of alternatives and provides additional information on the content of the FS Report.

Section 10 - Progress Reports

Respondent shall submit written monthly progress reports in accordance with Section XII of the Orders, Progress Reports and Notice. The Progress Reports shall include the following information:

- a) A description of the Work performed during the reporting period. For field activities, include boring logs, drilling and sampling locations, depths, and descriptions, and field notes;
- b) A description of any deviations from approved work plans or schedules during the reporting period and the date of Ohio EPA's approval of any such deviations;
- c) A summary of all field and laboratory analytical data generated or received during the reporting period;
- d) Summaries of all contacts during the reporting period with representatives of the local community, public interest groups or government agencies related to conducting the Work;
- e) Summaries of problems or potential problems encountered during the reporting period and any actions taken to rectify or prevent problems;
- f) Changes in project personnel or contractors during the reporting period;
- g) Tasks scheduled for the next two reporting periods;
- h) Copies of daily reports, inspection reports, or other reports as may be required by an approved work plan;
- i) Identification of the sources, types, quantities, test results, and disposition of investigation derived and other project wastes generated or disposed of during the reporting period.

In addition, Respondent shall provide all laboratory data within the Progress Reports and in no event later than 60 days after samples are shipped for analysis for raw analytical data and 90 days after samples are shipped for validated analytical data.

Appendix A

Preinvestigation Evaluation Report

Respondent shall prepare and submit for Ohio EPA review and comment a Preinvestigation Evaluation Report (PER) which documents Respondent's performance of the scoping tasks identified in Section 1 and Appendix A of this SOW. The PER shall also include a Level 1 Scoping ERA as described in Appendix I of this SOW and Chapter 2 of the DERR ECO Guidance.

PER Tasks

I. Description of Current Conditions

Respondent shall collect and analyze existing information available for the Site to develop a preliminary CSM to assist in assessing the nature and the extent of contamination, identifying potential exposure pathways and potential human and ecological receptors, preliminarily evaluating ARARs, developing general response actions and preliminary remedial alternatives, and gathering and analyzing existing Site background information. Sources of information include a review of Ohio EPA and other public files (including analytical results obtained from prior site investigations and assessments conducted by Ohio EPA and others relative to the Site) and interviews with employees, officers and agents (past and present) associated with the Site. Additional sources of existing information are described in Table 2.1 of the U.S. EPA RI/FS Guidance and Chapter 2 of the DERR ECO Guidance.

A. Existing Analytical Data (U.S. EPA RI/FS Guidance Section 2.2.2)

Respondent shall compile existing analytical data relating to contamination at the Site, and summarize the results in terms of physical and chemical characteristics, contaminant concentrations, and media affected. Data relating to soil, ground water, surface water, sediment, air, or biotic contamination shall be included as available. Use of any data that was not collected and analyzed pursuant to a QAPP approved by Ohio EPA must be supported by inclusion of all relevant quality assurance and quality control information. Consistent with the DQO guidance listed in the Guidance List attached to the Orders, Respondent shall identify the DQOs for all existing data on which Respondent intends to rely.

B. Conduct Site Visit

Respondent shall coordinate a site visit with Ohio EPA to assist in developing a conceptual understanding of sources and areas of contamination, potential exposure pathways, and potential human and ecological receptors. Respondent shall also observe the Site's physiography, hydrology, geology, demographics, natural resources, and ecological and cultural features.

C. Site Background

Respondent shall prepare and include in the PER a summary of the regional location, pertinent area boundary features, and physical geography at and near the Site. The summary shall be based on existing information and shall include characteristics such as surface hydrology, hydrogeology, geology (including cross-sections if available), and the total area of the Site. The summary shall also include the general nature of the problem, particularly with respect to the historic use of the Site relative to disposal or release of contaminants. Respondent shall also include background information on land use, natural resources, and climatology. Respondent may reference applicable existing reports. Respondent shall, at a minimum, provide the following:

1. Map(s) depicting;
 - a. General geographic location;
 - b. Property lines, with the owners of all adjacent property clearly indicated;
 - c. Topography and surface drainage with appropriate contour interval and scale depicting all waterways, wetlands, flood plains, water features, drainage patterns, and surface water containment areas;
 - d. All tanks, buildings, utilities, paved areas, easements, rights-of-way, and other features;
 - e. All known active or past waste treatment, storage or disposal areas and the dates of their operation;
 - f. All known past and present product and waste underground tanks and/or piping;

- g. All known past or present locations of spills or other releases of contaminants or any other potential contaminant source areas;
- h. Surrounding land uses (residential, commercial, agricultural, recreational) including zoning designations;
- i. Wetlands and surface water bodies;
- j. Previous sampling locations and dates of sampling for all media;
- k. The location of all wells, including monitoring and public and private water supply wells. These wells shall be clearly labeled and ground and top of casing elevations and construction details shall be included where available (elevations and construction details may be included as an appendix to the PER). Respondent shall determine whether any of the identified wells are currently being used, particularly as a source of potable water;
- l. Federal Sole Source Aquifer designations and Drinking Water Source Water Protection Areas for public water supplies.

Maps shall be of sufficient detail and accuracy to locate and depict current and future work performed at the Site. Maps shall be submitted as hard copy and in a digital format, using either a shapefile (*.shp) or drawing exchange format file (*.dxf) in a known coordinate system (e.g., Ohio State Plane South Zone, Datum = NAD83, units = feet)¹. Significant features will be created using standard survey techniques or with a global positioning system unit capable of sub-meter accuracy horizontal data capture.

- 2. A history and description of ownership and operation (past and current), including: generation of wastes and any treatment, storage and/or disposal activities at the Site;

¹ The term "shapefile" (*.shp) refers to the electronic file format used by the ArcGIS software systems produced by the ESRI Company, a major supplier of geographic information system products. The term "dxf" means "drawing exchange format" (*.dxf), a standard electronic file format used by AutoCad® and other graphics software systems

3. Approximate dates or periods of past product and waste spills or discharges, identification of the materials spilled or discharged, the amount spilled or discharged, the location where spilled or discharged, and a description of any response actions conducted at the time (local, state, or federal response units or private parties), including any inspection reports or technical reports generated as a result of the response;
 4. A summary of past and present permits requested and/or received and a list of permit related documents and studies;
 5. A summary of past and present enforcement actions and a list of related documents and studies;
 6. Identification of any violations of past or present discharge permit limitations and related documents;
 7. A summary of any previous response actions conducted by either local, state, federal, or private parties, a summary of the data generated as a result of the response actions, and a list of response related documents and studies; and
 8. A summary of known or suspected source areas and other areas of known or suspected contamination, and a list of related documents and studies.
- D. Nature and Extent of Contamination (U.S. EPA RI/FS Guidance, Section 2.2.2)

Respondent shall prepare a summary of the nature and extent of contamination at the Site based on the review of existing information. The summary shall include, but not be limited to, descriptions of the types, physical states, and amounts of contaminants known or suspected to be associated with the Site; the type and volume of environmental media affected or potentially affected by the contaminants; any known or suspected contaminant source areas; the presence and condition of any drums, tanks, lagoons, landfills, or other forms of containment; the potential pathways of contaminant migration; and any actual or potential human and/or ecological exposure to contaminants. Emphasis should be placed on describing the threat or potential threat that may exist to public health and/or the environment. The summary shall include tables

displaying the minimum and maximum levels of detected contaminants for Site areas and media, and identification of areas where additional information is necessary.

E. Develop a Conceptual Site Model (U.S. EPA RI/FS Guidance, Figure 2-2)

Based on the results of the above tasks, Respondent shall develop a preliminary CSM to evaluate potential threats to human health and the environment. The CSM shall include known and suspected sources of contamination, types of contaminants and affected media, known and potential routes of contaminant migration, and known or potential human and environmental receptors.

II. Review and Integration of Emergency or Interim Actions

Respondent shall evaluate any previous response actions that may have been undertaken at the Site for consistency with the preliminary CSM and to determine if the initial response objectives are being met. Respondent shall include this evaluation and proposals to address identified issues, if any, in the PER.

III. Pre-investigation Evaluation of Remedial Action Technologies, Process Options, and Broadly Defined Remedial Alternatives

Following the review of existing information and development of the preliminary CSM, Respondent shall refine the preliminary RAOs identified in the Orders to specify the contaminants of potential concern, the actual or potential exposure pathways, and the preliminary remediation goals (PRGs) for each exposure pathway (see the Guidance List attached to the Orders, DERR-00-RR-038, *Use of Risk-based numbers in the Remedial Response Process, Overview*, and Section 4.2.1 of the U.S. EPA RI/FS Guidance). The refined RAOs shall be consistent with the preliminary CSM.

Based on the preliminary CSM and refined RAOs, Respondent shall develop, evaluate and screen a preliminary range of potential remedial technologies and associated process options, and develop broadly defined remedial alternatives (Sections 4.2.2 through 4.2.6 of the U.S. EPA RI/FS Guidance). The screening of technologies and process options shall be based on their effectiveness, implementability, and cost as these terms are defined and used in Sections 4.2.5.1 - 4.2.5.3 of the U.S. EPA RI/FS Guidance.

Respondent shall consider the following during development of a preliminary range of potential remedial alternatives:

- A. Technologies and process options that may be appropriate for treating, containing, or disposing of wastes shall be identified, along with sources of literature on the technologies' effectiveness, application, and cost. Innovative technologies and resource recovery options will be included if they appear feasible.
- B. A preliminary list of broadly defined remedial alternatives that reflect the goal of preserving a range of alternatives in which treatment that significantly reduces the toxicity, mobility, or volume of waste is a principal element; one or more alternatives that involve containment with little or no treatment; a limited number of ground-water alternatives that attain site-specific remediation levels within differing time frames, and a no action alternative.
- C. For alternatives involving treatment, the need for treatability studies shall be evaluated as early in the RI/FS process as possible. The need for such studies shall be discussed in the Pre-investigation Evaluation Report.

Respondent shall also preliminarily identify potential ARARs and TBC criteria which may influence potential remedial alternatives and/or site characterization activities (Section 2.2.5 of the U.S. EPA RI/FS Guidance).

Respondent will revise and refine the preliminary CSM and supporting information (RAOs, contaminants of concern, routes of exposure, receptors, preliminary remedial alternatives, ARARs, and TBC criteria) throughout the RI/FS process as data become available and uncertainties are reduced.

IV. Identification of Data Needs and Data Usage

Based on the results of the above scoping tasks, Respondent shall identify the types of data that will need to be collected during the RI. At a minimum, data shall be collected sufficient to:

- A. Define Source Areas of Contamination;
- B. Define the Nature and Vertical and Horizontal Extent of Contamination;
- C. Define the Environmental Setting at the Site;
- D. Define Potential Pathways of Contaminant Migration;

- E. Define Hot Spots (see: U.S. EPA 1991 *A Guide to Principal Threat and Low Level Threat Wastes*) within source areas;
- F. Define Potential Receptors;
- G. Support the HHRA and ERA; and
- H. Support the Development and Evaluation of Remedial Alternatives (support development of the AAD and the FS).

Identification of data needs shall be coordinated with the expected uses for the data and the DQOs. Respondent shall identify the intended uses for the data and its adequacy in meeting the DQOs.

V. Pre-investigation Evaluation Report Format

- A. Introduction
- B. Project Initiation Meeting - summary of discussion and conclusions
- C. Description of Current Conditions
 - 1. Site Background
 - 2. Existing Data Analysis
 - 3. Site Visit
 - 4. Nature and Extent of Contamination
 - 5. Potential Receptor Identification
- D. Conceptual Site Model
- E. Level I Ecological Risk Assessment
- F. Pre-investigation Evaluation of Remedial Alternatives
 - 1. Preliminary Remediation Goals
 - 2. Remedial Action Objectives

- 3 Federal ARARs, state requirements, and TBCs
- 4. Preliminary Remedial Alternatives
 - a. Preliminary Screening of Remedial Technologies
 - b. Preliminary Screening of Process Options
 - c. Development of Preliminary Remedial Alternatives
- G. Identification of Data Needs and Data Usage
 - 1. Analysis of RI/FS SOW Tasks
 - 2. Data Needs
 - 3. Data Quality Objectives

Appendix B

Field Sampling Plan Format

Respondent shall prepare the FSP consistent with Sections 3.3.4.1 through 3.3.4.12 of the U.S. Army Corps of Engineers' guidance *Requirements for the Preparation of Sampling and Analysis Plans*, EM 200-1-3, February, 2001, using the following format:

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1.2 Summary of Existing Site Data

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5.1.2.1 Equipment

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5.2.1.2 Sample Collection and Field and Laboratory Analysis

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5.2.2 Field Procedures

5.2.2.1 Drilling Methods and Equipment

5.2.2.2 Materials (Casing, screen, etc.)

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5.2.2.4 Sampling Methods

5.2.2.5 Field Measurement Procedures and Criteria

5.2.2.6 Documentation

5.3 Ground Water

5.3.1 Rationale/Design

5.3.1.1 Monitoring Well Location and Installation

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5.3.1.3 Upgradient, QA/QC, and Blank Samples and Frequency

5.3.2 Monitoring Well Installation

5.3.2.1 Drilling Methods and Equipment

5.3.2.2 Materials

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5.3.2.2.4 Water Source

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Appendices

A. References

Appendix C

Quality Assurance Project Plan Elements

Group A. Project Management	Group B. Data Generation and Acquisition	Group C. Assessment and Oversight
A1 Title and Approval Sheet	B1 Sampling Process Design (Experimental Design)	C1 Assessments and Response Actions
A2 Table of Contents	B2 Sampling Methods	C2 Reports to Management
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A4 Project/Task Organization	B4 Analytical Methods	Group D. Data Validation and Usability
A5 Problem Definition and Background	B5 Quality Control	D1 Data Review, Verification, and Validation
A6 Project/Task Description	B6 Instrument/Equipment Testing, Inspection, and Maintenance	D2 Verification and Validation Methods
A7 Quality Objectives and Criteria	B7 Instrument/Equipment Calibration and Frequency	D3 Reconciliation with User Requirements
A8 Special Training/Certifications	B8 Inspection/Acceptance of Supplies and Consumables	
A9 Documentation and Records	B9 Non-direct Measurements	
	B10 Data Management	

Appendix D

Health and Safety Plan (HASP) - see also SOW Section 2.3

- I. Respondent shall submit a HASP that at a minimum addresses the following:
 - A. Facility or site description including availability of resources such as roads, water supply, electricity and telephone service;
 - B. Description of the known hazards and an evaluation of the risks
 - C. Listing of key personnel (including the site safety and health officer) and alternates responsible for site safety, response operations, and for protection of public health;
 - D. Delineation of work area, including a map;
 - E. Description of levels of protection to be worn by personnel in the work area, including a description of the personal protective equipment to be used for each of the site tasks and operations being conducted;
 - F. Description of the medical monitoring program;
 - G. Description of standard operating procedures established to assure the proper use and maintenance of personal protective equipment;
 - H. The establishment of procedures to control site access;
 - I. Description of decontamination procedures for personnel and personal protective equipment;
 - J. Establishment of site emergency procedures, including a contingency plan that meets the requirements of 29 CFR 1910.120(l)(1) and (l)(2);
 - K. Availability of emergency medical care for injuries and toxicological problems;
 - L. Description of requirements for an environmental monitoring program. (This should include a description of the frequency and type of air and personnel monitoring, environmental sampling techniques and a

description of the calibration and maintenance of the instrumentation used.);

- M. Specification of any routine and special training required for site personnel;
- N. Entry procedures for confined spaces; and
- O. Establishment of procedures for protecting workers from weather-related problems.

II. The HASP shall be consistent with:

- A. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985);
- B. Section 111©)(6) of CERCLA;
- C. U.S. EPA Order 1440.3 -- Respiratory Protection;
- D. U.S. EPA Order 1440.2 -- Health and Safety Requirements for Employees Engaged in Field Activities;
- E. U.S. EPA Occupational Health and Safety Manual;
- F. U.S. EPA Standard Operating Safety Guides (Publication 9285.1-03, PB92-963414, June 1992;
- G. OSHA regulations particularly in 29 CFR 1910 and 1926;
- H. State and local regulations; and
- I. Site or facility conditions.

Although Ohio EPA will review and may provide comment on the draft HASP, Ohio EPA will not approve the HASP. It is Respondent's responsibility to comply with applicable rules and regulations and to ensure that site workers, site visitors, and the surrounding community are protected from any hazards or potential hazards associated with the Site throughout the conduct of the RI/FS.

Appendix E

Environmental Setting

Respondent shall characterize the environmental setting of the Site. Characterization shall include discussion of regional and site hydrogeology, surface water and sediment, local climate, and human and ecological receptors. Components to be addressed include but are not limited to:

I. Regional Hydrogeology

Respondent shall characterize the regional hydrogeology surrounding the facility, including:

- A. Depth to bedrock;
- B. Hydrostratigraphic unit correlation (both map and profile view);
- C. Aquifer and aquitard delineation;
- D. Active and inactive residential, public, industrial, agricultural, and other production well locations within a four (4) mile radius of the Site;
- E. Well logs, with well construction details and average yield;
- F. Average pumping rates for production wells;
- G. Ambient ground water quality characterization;
- H. Average depth to water;
- I. Seasonal variation in ground water flow direction;
- J. Recharge and discharge area identification;
- K. Source water protection area identification;
- L. Aquifer designation (*i.e.*; federal Sole Source Aquifer; Drinking Water Source Water Protection Area);

- M. Regional geomorphology and topography, including locations of surface water bodies and floodways. This description should include an analysis of any features that may influence the ground water flow system; and
- N. Structural feature delineation, including bedding planes and fold, joint, and fracture trace orientation.

II. Site Hydrogeology

Respondent shall characterize site-specific hydrogeology based on data collected from bore holes, monitoring wells, piezometers, and laboratory and field tests. Characterization shall include but not be limited to the following:

- A. An accurate classification and description of the consolidated and unconsolidated stratigraphic units beneath the Site, including:
 - 1. Hydraulic conductivity (vertical and horizontal);
 - 2. Porosity, effective porosity, and bulk density;
 - 3. Rock and soil (ASTM 2488 and 2487) classification;
 - 4. Grain size distribution (sieve and hydrometer) curves;
 - 5. Moisture content;
 - 6. The attenuation capacity and mechanisms of attenuation of the natural earth material and/or fill (*i.e.*, ion exchange capacity, base saturation, organic carbon content, mineral content, soil sorptive capacity, storage capacity); and
 - 7. pH;
- B. Surface soils, including:
 - 1. Soil Conservation Service soil classification;
 - 2. Surface soil distribution;
 - 3. Depth and profile;

4. Organic carbon;
5. pH;
6. Porosity (total, air-filled);
- 7 Bulk density;
8. Gravimetric soil moisture content;
9. Fraction of vegetative cover (of contaminated areas);
10. ion exchange capacity;
11. Infiltration; and
12. Evapotranspiration.

C. A description of the local ground water flow regime, including:

1. Identification of all aquitards and aquifer systems (hydrogeologic formations wholly or partially saturated and capable of transmitting flow);
2. Identification of saturated zones;
3. Identification of water table and potentiometric surface depth with degree of seasonal fluctuation;
4. Identification of seasonal ground water flow direction for each aquifer system including water table and/or potentiometric surface contour maps for each significant zone of saturation;
5. Quantification of flow rate throughout each aquifer system;
6. Quantification of horizontal and vertical gradients;
7. Quantification of infiltration rates through the unsaturated zone;

8. Quantification of flow across and lateral to hydrostratigraphic units, including the degree of seepage and upward leakage;
 9. Quantification of flow budget across the Site with identification of recharge and discharge areas;
 10. Location of nearest hydraulic boundaries;
 11. Characterization of ambient ground water chemistry both upgradient and downgradient of the Site;
 12. Hydrostratigraphic cross sections depicting horizontal and lateral extent, depth, and thickness of units. Cross sections shall be developed both longitudinally and transverse to the dominant direction of flow across the Site. Cross sections shall include flow nets distinguishing vertical and horizontal components of flow across stratigraphic units; and
 13. Delineation of structural features, including orientation, density, and distribution.
- D. A description of man-made influences that may affect the hydrogeology of the Site, identifying:
1. Active and inactive water supply and production wells with pumping schedules; and
 2. Man-made structures such as injection wells, pipelines, french drains, ditches, unlined and lined ponds, lagoons, septic tanks, NPDES permitted out falls, retention areas and utility lines.
- E. An area-specific description of the geomorphology at the Site. At a minimum this shall include;
1. An analysis of any topographic feature that may influence the ground water flow system;
 2. A surface topography map depicting (at a minimum) streams, wetlands, topographic depressions and springs. The topographic map shall be constructed by a qualified professional and shall provide contour intervals at a level of detail appropriate for the site-

specific hydrogeologic investigation (e.g., two-foot intervals). The map shall depict the location of all borings, monitoring wells and cross sections.

F. The RI Report shall document the methods and procedures used to gather and evaluate the hydrogeologic data. These methods and procedures shall be in accordance with the approved RI/FS Work Plan. Field methods may include but are not limited to:

1. Borehole characterization;
2. Ground water level measurements;
3. Ground water sampling;
4. Monitoring well and piezometer installation;
5. Aquifer testing (e.g., pump and slug testing) to determine the degree of hydraulic communication between hydrostratigraphic units and subsurface structure;
6. Remote sensing, including geophysical techniques to identify zones of saturation, hydrostratigraphic units, and subsurface structure;
7. Ground water tracer testing to assist in determining migration pathways and hydraulic conductivity; and
8. Isotopic age dating of ground water to assist in migration pathway identification.

III. Surface Water and Sediment

Respondent shall conduct a program to characterize any surface water bodies in the vicinity of the Site. Such characterization shall include, but is not limited to:

A. Description of the perennial and ephemeral surface water bodies including:

1. For lakes and estuaries: location, elevation, surface area, inflow, outflow, depth, temperature stratification and volume;

2. For impoundments: location, elevation, surface area, depth, volume, freeboard and purpose of impoundment;
 3. For streams, ditches, drains, wetlands, and channels. location, hydraulic gradient, flow velocity, base flow, depth, width, bank height and slope, gaining and losing stream sections, seasonal fluctuations, stabilization of stream bed; description of stream banks; flood plain areas, and flood zones (*i.e.*, 50 and 100 year events); area of drainage basin;
 4. Drainage patterns/storm water runoff;
 5. Degree of ground water seepage and/or recharge to surface waterbodies;
 6. Any known discharges including those permitted by NPDES; and.
- B. Description of the chemical, physical and biological/biochemical characteristics of the surface water and sediments. This includes but is not limited to:
1. Chemical (surface water and/or sediment)
 - a. Total organic carbon (TOC);
 - b. pH;
 - c. total dissolved solids;
 - d. total suspended solids;
 - e. biochemical oxygen demand (BOD);
 - f. conductivity; and
 - g. dissolved oxygen.
 2. Physical (surface water and/or sediment)
 - a. temperature;
 - b. particle/grain size;
 - c. appearance/texture/odor/color;
 - d. organic matter deposition;
 - e. Deposition area, patterns, and rates; and
 - f. Thickness profile.

3. Biological/Biochemical

- a. Aquatic life use designation based on Ohio's Water Quality Standards²;
- b. Attainment status of water body; and
- c. Ohio wetland classification.

The RI Report shall document the methods and procedures used to gather and evaluate the surface water and sediment data. These methods and procedures shall be in accordance with the approved RI/FS Work Plan. Field methods may include but are not limited to:

- a. drain tracer studies;
- b. seepage meter installation and data acquisition;
- c. stream piezometer installation and water level acquisition; and
- d. stream weir gauge installation and data acquisition.

IV. Local Climate

Respondent shall provide information characterizing the climate in the vicinity of the Site in general, and at the time of the investigation(s). Such information shall include, but not be limited to:

- A. A description of the following parameters:
 - 1. Annual and monthly rainfall averages;
 - 2. Monthly temperature averages and extremes;
 - 3. Wind speed and direction;
 - 4. Relative humidity/dew point;
 - 5. Atmospheric pressure;

² Ohio Water Quality Standards, OAC Chapter 3745-1

6. Evaporation data;
 7. Development of inversions; and
 8. Climate extremes that have been known to occur in the vicinity of the facility, including frequency of occurrence.
- B. A description of topographic or manmade features which may affect air flow or emission patterns, including:
1. Ridges, hills or mountain areas;
 2. Canyons or valleys;
 3. Surface water bodies;
 4. Wind breaks and forests;
 5. Buildings; and
 6. Any other features that may affect air flow or emission patterns.
- V. Human receptors potentially exposed to Site-related contaminants, including:
- A. human population data including demographics;
 - B. sensitive sub-populations;
 - C. populations served by surface water intakes or ground water wells; and
 - D. land use (e.g., residential, commercial, recreational).
- VI. Ecological receptors potentially exposed to site-related contaminants, including:
- A. terrestrial receptors;
 - B. aquatic receptors; and
 - C. special interest species (including Threatened and Endangered species).

Appendix F

Source Characterization

Respondents shall characterize the source or sources of site contamination, including the unit/disposal area and physical and chemical characteristics of source area contaminants. The source characterization shall include but not be limited to the following:

- I. Unit/Disposal Area:
 - A. Location;
 - B. Type;
 - C. Design features;
 - D. Operating practices (past and present);
 - E. Period of operation;
 - F. Age;
 - G. General physical conditions;
 - H. Methods used to closure and monitoring; and
 - I. Estimation of initially disposed contaminant mass.
- II. Waste/Contaminant Characteristics
 - A. Type of waste
 - 1. Waste types and classification (*e.g.*, hazardous due to listed, flammable, reactive, corrosive, oxidizing or reducing agent; Toxic Substances Control Act wastes, solid, municipal, and/or industrial);
 - 2. Quantity; and
 - 3. General chemical class (*e.g.*, acid, base, solvent).

B. Waste/Contaminant Physical and chemical characteristics

1. Phase (*e.g.*, solid, liquid, gas);
2. Physical description (*e.g.*, powder, oily sludge);
3. Temperature;
4. pH;
5. Molecular weight;
6. Density;
7. Boiling point;
8. Viscosity;
9. Solubility in water;
10. Cohesiveness of the wastes;
11. Vapor pressure;
12. Henry's law constant;
13. K_{ow} ;
14. K_d ; and
15. Flash point.

C. Waste/Contaminant migration and dispersal characteristics

1. Retardation;
2. Biodegradation rates;
3. Photodegradation rates;
4. Hydrolysis rates;

5. Chemical transformation rates and degradation products;
6. Chemical interactions;
7. Products of all such reactions or processes;
8. Leachate infiltration rates and contaminant mass loading to aquifer systems; and
9. Soil screening concentrations.

Respondent shall document the procedures used in making the above determinations.

Appendix G

Nature and Extent of Contamination

I. Ground water Contamination

Respondent shall conduct a ground water investigation to characterize the nature and extent of any ground water contamination at the Site. The investigation shall include a description and quantification of ground water quality in the aquifer systems and all zones of saturation or permeable zones that may act as pathways for contaminant migration. The investigation shall include but not be limited to the following:

- A. Characterization of the horizontal and vertical extent of any immiscible or dissolved phase contaminant plume(s), including sampling of ground water potentially discharging contaminants to surface waters for compliance with Water Quality Standards;
- B. Delineation of contaminant specific flow velocity vectors in map and profile view;
- C. Construction of contaminant specific isopleths in map and profile view. Isopleths should be superimposed over map and profile views for each aquifer system, including significant zones of saturation above the water table;
- D. Extrapolation of future contaminant migration rates and distribution;
- E. Identification and sampling of ground water production wells, including residential, public, industrial, agricultural, and other production wells within or in the vicinity of the contamination; and
- F. Determination of the degree of seasonal variation in ground water contaminant concentrations.

II. Surface and Subsurface Soil Contamination

Respondent shall conduct an investigation to characterize the nature and extent of surface and subsurface soil contamination at the Site. This includes areas where contaminants may have migrated due to airborne deposition or transport

with surface water runoff. The investigation shall include but not be limited to the following information:

- A. A description of the vertical and horizontal extent and pattern of contamination;
- B. A description of contaminant and soil chemical, biological, and physical properties, including contaminant solubility, speciation, adsorption, leachability, exchange capacity, biodegradation, hydrolysis, photolysis, oxidation and other factors that might affect contaminant migration and transformation;
- C. Delineation of contaminant specific concentrations;
- D. Description of mechanisms and patterns of soil contaminant migration; and
- E. An extrapolation of future soil contaminant movement.

III. Surface Water and Sediment Contamination

Respondent shall conduct an investigation to characterize the nature and extent of contamination in or discharging to surface waters and sediments. The investigation shall include, but not be limited to, the following:

- A. Characterization of the horizontal and vertical extent of any immiscible or dissolved phase contamination in surface waters, sediments, and seeps, including sampling of seeps potentially discharging contaminants to surface waters for compliance with Water Quality Standards;
- B. Delineation of the horizontal and vertical distribution of any immiscible, dissolved, or suspended surface water contamination in map and profile view;
- C. Delineation of the horizontal and vertical distribution of any sediment and sediment pore water contamination in map and profile view;
- D. The velocity and direction of contaminant migration in surface water and sediment,

- E. An evaluation of the physical, biological and chemical factors influencing contaminant migration; and
- F. An extrapolation of future contaminant migration.

IV. Subsurface Gas Contamination

Respondent shall conduct an investigation to characterize the nature and extent of subsurface gases emitted from contaminants in soil, wastes, or ground water. Respondent shall investigate and evaluate the soil vapor intrusion exposure pathway to determine whether soil vapor poses an unacceptable threat to human health, including the potential for the generation of flammable or explosive gases such as methane.

The subsurface gas investigation shall include the following information:

- A. A description of the extent of subsurface gas contamination, including horizontal and vertical contaminant concentration profiles;
- B. An evaluation of preferential subsurface gas migration pathways;
- C. The chemical composition of subsurface gases;
- D. The rate, amount, and density of the subsurface gases being emitted;
- E. Subsurface gas contaminant fate and transport;
- F. A survey of inhabitable structures (residential and commercial/industrial) and land use;
- G. An investigation and evaluation of the indoor air vapor intrusion pathway;
- H. An investigation and evaluation of the threat of fire or explosive conditions as a result of subsurface gas migration; and
- I. Determination of the degree of seasonal variation in subsurface gas contaminant concentrations, migration rates, and distribution.

Respondent shall refer to the vapor intrusion guidance included in the Guidance List attached to the Orders when planning and conducting the vapor intrusion component of the subsurface gas investigations.

V. Air Contamination

Respondent shall investigate the extent of atmospheric contamination resulting from contaminants found to be present at the Site. The investigation shall include an assessment of the potential for the contaminants to enter the atmosphere, description of local wind patterns, and the anticipated fate of airborne contaminants. The investigation shall provide the following information:

- A. A description of the horizontal and vertical direction and velocity of contaminant movement;
- B. The rate and amount of the release;
- C. Ambient (outdoor) air contaminant concentrations;
- D. Indoor air contaminant concentrations resulting from ambient releases;
- E. The chemical and physical nature of contaminated particulates including respirable portion, source emission rates, and contaminant concentrations in respirable portions;
- F. The chemical and physical composition of the contaminants released, including vertical and horizontal concentration profiles; and
- G. Environmental factors that affect fate and transport of contaminants in the atmosphere.

VI. Other Media

Respondent shall conduct additional investigations as necessary to support the HHRA and/or ERA with respect to other media that may be contaminated. This may include tissue contaminant concentrations in vegetation, crops, home grown produce, meats, prey, macroinvertebrates, fish, shellfish or other tissues for which exposure is reasonably anticipated by human and/or ecological receptors.

Appendix H

Human Health Risk Assessment

Respondent shall conduct a baseline HHRA, which includes, but not limited to:

I. Revise the Conceptual Site Model

Prior to preparing the baseline HHRA, Respondent shall revise the CSM prepared during scoping based on the data collected during the RI and include the revised CSM in the Risk Assessment Assumptions Document (RAAD) discussed in Section 4.1 of this SOW. See Section 4.2 of RAGS, Part A and Section 2.2.2.2 of the U.S. EPA RI/FS Guidance for specific details on the development of the CSM. The revised CSM shall identify all potential or suspected sources of contamination, types and concentrations of contaminants, potential exposure pathways, and all current and potential receptors. Based upon the revised RAAD, Respondent shall prepare a baseline HHRA as outlined below to be included in the RI/FS Report.

II. Data Collection and Evaluation Process

The purpose of data collection and evaluation is to obtain reliable chemical release and exposure data for quantitative human health risk assessment. The data collection and evaluation process is accomplished via the completion of the approved work plans. It should be noted that the evaluation of risk to human health is an iterative process as data are gathered during the RI. See Chapters 4 and 5 of RAGS Part A for specific details on the data collection and evaluation process. The following is a general outline of the data collection and evaluation step in the HHRA:

A. Data Collection

1. collect existing data;
2. collect background data; and
3. collect data per the work plan(s)

B. Data Evaluation

1. combine data from site investigations;

2. evaluate analytical methods;
3. evaluate quantitation limits;
4. evaluate qualified and coded data;
5. evaluate blanks;
6. evaluate tentatively identified compounds; and
7. identify chemicals of potential concern (based on):
 - a. Background concentrations derived in accordance with the background guidance, and;
 - b. Contaminant toxicity (including as appropriate, toxicologically-based screening values).

III. Exposure Assessment

The objective of the exposure assessment is to estimate the type and magnitude of exposures of potential receptors to chemicals of potential concern. The results of the exposure assessment are combined with chemical-specific toxicity information to characterize potential health risks. See Chapter 6 of Part A for specific details on conducting an acceptable exposure assessment.

Respondent shall:

- A. Combine site data and environmental modeling results to:
 1. identify potentially exposed populations;
 2. identify potential exposure pathways; and
 3. estimate exposure point concentrations.
- B. Estimate of Chemical Intakes. Respondent shall provide estimates of chemical intakes as appropriate from:
 1. Air (atmospheric and indoor air);
 2. Soil;

3. Ground water;
4. Surface water;
5. Sediment; and
6. Other exposure pathways as appropriate (e.g., food-stuffs, fish and game (see Chapter 6 of RAGS, Part A for exposure assessment information regarding intake of contaminated food items)).

IV. Toxicity Assessment

The purpose of the toxicity assessment is to weigh evidence regarding the potential for particular contaminants to cause adverse effects in exposed individuals and to provide, where possible, an estimate of the relationship between the extent of exposure to a contaminant and the increased likely-hood and/or severity of adverse effects.

Respondent shall evaluate critical toxicity values (e.g., numerical values describing a chemical toxicity) and review general toxicological information for the indicator chemicals. Chapter 7 of RAGS, Part A provides specific details for conducting an acceptable toxicity assessment. DERR's *Assessing Compounds without Formal Toxicity Values for Use in Human Health Risk Assessment* identifies sources for obtaining acceptable toxicity criteria. Respondent shall:

- A. Gather qualitative and quantitative toxicity information for substances being evaluated;
- B. Identify exposure periods for which toxicity values are necessary;
- C. Determine toxicity values for non-carcinogenic effects;
- D. Identify, if possible, mechanism or mode of action of toxicity and/or target organ(s) for all non-carcinogenic potential contaminants of concern; and,
- E. Determine toxicity values (e.g., slope factors) for all carcinogenic chemicals.

V. Risk Characterization

A. Respondent shall provide a detailed characterization of the risks or hazards posed by releases from the Site. See Chapter 8, RAGS Part A for specific information on completing the risk characterization process. The characterization shall include the following elements:

1. Review outputs from toxicity and exposure assessments;
2. Quantify risks/hazards from individual chemicals;
3. Quantify risks/hazards from multiple chemicals where appropriate;
4. Combine risks/hazards across exposure pathways where appropriate;
5. Assess present uncertainty; and
6. Consider site-specific human studies where appropriate.

B. Potential non-carcinogenic adverse effects are evaluated using the Hazard Quotient or Hazard Index approach, where:

For individual non-cancer chemical evaluations, the Hazard Quotient (HQ) methodology is used:

$$HQ = E/RfV$$

where:

E = exposure level (or intake) for the toxicant

RfV = reference dose (RfD) or concentration (RfC) for the toxicant;
and,

E and RfV are expressed in the same units and represent the same exposure period (*i.e.*, chronic, sub-chronic, or shorter term) and route of exposure (*i.e.*, inhalation, ingestion, or, dermal absorption).

Exposures to multiple non-cancer toxicants are evaluated using the Hazard Index (HI) approach, where:

$$HI = E_1/RfV_1 + E_2/RfV_2 + \dots E_i/RfV_i$$

where:

E_i = exposure level (or intake) for the i^{th} toxicant

RfV_i = reference dose for the i^{th} toxicant

E and RfV are expressed in the same units and represent the same exposure period (*i.e.*, chronic, sub-chronic, or shorter term) and route of exposure (*i.e.*, inhalation, ingestion, or, dermal absorption)

Hazards for the various exposure pathways are to be summed as appropriate based on reasonable exposure pathway combinations and receptor exposure. See Section 8.2.2 of Chapter 8 of RAGS Part A for details on the aggregation of hazards. Non-cancer hazard estimates should be expressed using one significant figure only.

- C. Potential carcinogenic effects are estimated using the predicted risk approach, where:

$$\text{Risk} = \text{CDI} \times \text{SF}$$

where:

Risk = a unitless probability (*e.g.*, $1 \text{ E-}5$) of an individual developing cancer;

CDI = chronic daily intake averaged over 70 years ($\text{mg.kg}^{-1}.\text{day}^{-1}$);
and,

SF = slope factor, expressed in $(\text{mg.kg}^{-1}.\text{day}^{-1})^{-1}$.

Exposure to multiple carcinogens are evaluated using the following equation:

$$\text{Risk}_T = \sum \text{Risk}_i$$

where:

$Risk_T$ = the total cancer risk, expressed as a unitless probability; and,

$Risk_i$ = the risk estimate for the i^{th} substance.

It is assumed that risks are additive when receptors are exposed to multiple carcinogenic compounds. Risks for the various exposure pathways are to be summed as appropriate based on reasonable exposure pathway combinations and receptor exposure. Resulting cancer risk estimates should be expressed using one significant figure only.

D. Uncertainties

Respondent shall provide a discussion of the uncertainties and assumptions made in the assessment process. See Section 8.4 in Chapter 8 of RAGS Part A for specific details regarding the assessment and presentation of uncertainty.

Appendix I

Ecological Risk Assessment

The DERR ECO Guidance follows a phased approach for ecological risk assessment. Specifically, the DERR ECO Guidance is divided into 4 levels:

I. Level I Scoping ERA

The purpose of the Level I Scoping ERA is to determine whether there exists any potential for site contamination to impact or adversely effect any important ecological resource at or in the vicinity of the Site. Respondent shall complete a Level I Scoping ERA during the RI/FS scoping phase (Section 1 and Appendix A of this SOW) and incorporate the Level I ERA Report into the Preinvestigation Evaluation Report (PER). The major tasks of the Level I Scoping ERA consist of:

A. Site Characterization

Based on a review of existing data and a habitat evaluation of the Site and its surroundings, Respondent shall consider the following:

1. Site Background/Site History;
2. Identification of any Important Ecological Resource potentially impacted by site-related contamination (see: page 6-2 of DERR ECO Guidance for the definition of Important Ecological Resource); and
3. Known or suspected releases of contamination in any medium present at the Site.

B. Decision to complete additional ecological assessment

Respondent shall:

1. Summarize the completed risk assessment and, based on the results, determine if additional risk assessment is warranted.

Specific requirements for conducting the Level I Scoping ERA are described in Chapter 2 of the DERR ECO Guidance. Respondent shall address each of these requirements, including the check sheets, and include the results in the PER.

II. Level II Screening ERA

If the approved Level I Scoping ERA identifies an important ecological resource that may potentially be exposed to contamination from the Site, Respondent shall include in the RI/FS Work Plan and supporting documents all tasks necessary to conduct a Level II Screening ERA. The purpose of the Level II Screening ERA is to use the data generated during the RI to refine the list of detected contaminants per medium, identify chemicals of potential ecological concern (COPECs) and non-chemical stressors, evaluate potentially impacted aquatic habitats for attainment of Water Quality Standards, complete the list of ecological receptors, and refine the CSM. The major tasks of the Level 2 Screening ERA consist of:

- A. Description of the Site:
 - 1. Describe the physical and chemical factors that impact site ecology (*e.g.*, fate and transport of contaminants, bioavailability, etc.);
 - 2. Describe past or current practices, disturbances, or stressors that may have impact(ed) site ecology;
 - 3. Describe the areal extent of environmental assessment; and
 - 4. Describe current and projected land use in and around the Site as relevant to site ecology.
- B. Identify all impacted and potentially impacted exposure media (*e.g.*, soil, sediment, surface water, and tissue).
- C. Identify/list important ecological resources and potentially impacted site-specific ecological receptors.
- D. Perform semi-quantitative surveys of flora and fauna that are or may be exposed to contamination, including but not limited to:
 - 1. Vegetative strata;
 - 2. Flora and fauna in all contaminated media;

3. Population parameters (e.g., density, frequency, age distribution); and
4. Community parameters (e.g., diversity, structure, stability).

Seasonal effects can impart a profound influence on the results of biological or ecological sampling. Respondent shall address seasonal requirements for sampling or testing of terrestrial flora and fauna in the RI/FS Work Plan and RI/FS project schedule.

- E. List chemicals of potential ecological concern (COPECs) (contaminants remaining following the screening process; full documentation of the screening process is required).
- F. Evaluate site-specific chemical concentrations and attainment Water Quality Standards. Both chemical-specific and biological criteria may apply to the water body. Respondent shall address seasonal requirements for biological sampling for the demonstration of full attainment of surface water criteria in the RI/FS Work Plan and RI/FS project schedule.
- G. Identify complete exposure pathways and refine the CSM.
- H. Define ecologically appropriate assessment endpoints, measurement endpoints, and endpoint selection criteria.
- I. Propose one of the following decisions based on the results of the Level II Screening ERA:
 1. Unacceptable actual or potential hazards identified (e.g., concentrations above screening levels and/or surface waters fail to meet Water Quality Standards), ERA completed;
 2. Continued evaluation (Level III Baseline ERA), or

3. No unacceptable actual or potential hazard identified (e.g., concentrations below screening levels and surface waters meet Water Quality Standards), ERA completed.
- J. Summarize the completed risk assessment and the decision for additional risk assessment if warranted.
- K. Specific requirements for conducting the Level II Screening ERA are further described in Chapter 3 of the DERR ECO Guidance. At the conclusion of the Level II ERA, Respondent shall submit for review and approval a Level II Screening ERA addressing each of the tasks in Chapter 3 of the DERR ECO Guidance. If the approved Level II Screening ERA Report concludes that performance of a Level III Baseline ERA is appropriate and additional site characterization is necessary to support the Level III ERA, Respondent shall submit for review and approval an addendum to the RI/FS Work Plan and supporting documents, including a revised RI/FS project schedule, describing in detail the tasks necessary to conduct the Level III Screening ERA. If the approved Level II ERA concludes the performance of a Level III Baseline ERA is appropriate but additional site characterization is not necessary to support the Level III Baseline ERA, Respondent shall submit a revised RI/FS project schedule for review and approval which includes the date for submittal of the Level III ERA Report.

III. Level III Baseline ERA

If the approved Level II Screening ERA concludes that additional assessment is necessary, Respondent shall complete a Level III Baseline ERA which includes an exposure assessment, toxicity assessment, risk characterization, and uncertainty analysis. The major tasks of the Level III Baseline ERA consist of:

A. Exposure Assessment

The exposure assessment is a quantitative evaluation of the magnitude, frequency, duration, and route of exposure for ecological receptors to site-related ecological stressors identified in the screening ERA. The exposure assessment may consist of direct contact evaluations of more sessile organisms (e.g., plants, soil invertebrates), or food web models to estimate exposure of chemicals of potential ecological concern (COPECs) to more mobile ecological receptors (e.g., short-tailed shrew, meadow

vole, red fox etc.) via ingestion of soil, and/or food items. See chapter 4 of DERR ECO Guidance for additional details.

B. Toxicity Assessment

The toxicity assessment shall evaluate the appropriate toxicity data for all COPECs and develop an ecologically-based reference dose (ERfD) for each COPEC to be used in assessing possible harm to ecological receptors. Respondent shall perform a literature review of toxicity information for the toxicity of each COPEC, and apply the appropriate uncertainty factors or other approved methods (e.g., allometric scaling) to derive the corresponding ERfD values. See chapter 4 of DERR ECO Guidance.

C. Risk Characterization

Risk characterization estimates the potential hazards to endpoint species under a specific set of circumstances. Risk characterization involves a quantitative and, when necessary, qualitative estimation of potential harm and includes a narrative description of the harm.

1. For all quantitative assessments, hazard is assessed with the use of a quotient methodology. The environmental hazard quotient (EHQ) = (exposure point concentration) (EPC) (*i.e.*, dose or medium concentration as appropriate) / ERfD. An environmental hazard index (EHI) is derived by summing all appropriate EHQs per receptor ($EHI = \sum EHQ$).
2. Hazard description is a qualitative narrative of the potential hazards presented by the Site and includes a discussion of any toxicological and ecological factors beyond those embodied in the quantitative estimates (e.g., COPECs without toxicity data). Hazards must be described for each COPEC-pathway-receptor combination and each assessment endpoint.

3. Uncertainty Analysis

The uncertainty analysis summarizes assumptions made for each element of the assessment, evaluates their validity, strengths and weaknesses of the analyses, and quantifies to the extent possible the uncertainties associated with each potential hazard. Both qualitative and quantitative assessment results shall be described and discussed. If additional data or more certainty in the assessment process or results is needed, Respondent shall conduct a field-baseline ERA (Level IV).

- D. Respondent shall propose one of the following decisions based on the results of the Level II Screening ERA:
1. Unacceptable actual or potential hazards identified (e.g., concentrations above screening levels and/or surface waters fail to meet Water Quality Standards), ERA completed;
 2. Continued evaluation (Level IV Field-Baseline ERA), or
 3. No unacceptable actual or potential hazard identified (e.g., concentrations below screening levels and surface waters meet Water Quality Standards), ERA completed.
- E. Summarize the completed risk assessment and the decision for additional risk assessment if warranted.

Specific requirements for conducting the Level III Baseline ERA are further described in Chapter 4 of the DERR ECO Guidance. At the conclusion of the Level III Baseline ERA, Respondent shall submit for review and approval a Level III Baseline ERA Report consistent with Chapter 4 of the DERR ECO Guidance. If the approved Level III Baseline ERA Report concludes that performance of a Level IV Field-Baseline ERA is appropriate, Respondent shall submit for review and approval an addendum to the RI/FS Work Plan and supporting documents, including a revised RI/FS project schedule, describing in detail all tasks necessary to conduct the Level IV Filed-Baseline ERA.

IV. Level IV Field-Baseline ERA

- A. If the approved Level III Baseline ERA concludes that additional assessment is necessary, Respondent shall complete a Level IV Field-Baseline ERA consistent with the requirements of Chapter 5 of the DERR ECO Guidance. The objective of the Level IV Field-Baseline ERA is to quantify, based on field observations, potential adverse impacts to populations of representative species based on the hazard calculations developed in the Level III Baseline ERA. Respondent shall evaluate the information generated during the Level IV Field-Baseline ERA as additional lines of evidence to support a more robust weight-of-evidence conclusion regarding the potential adverse effects identified and quantified in the Level III Baseline ERA. Given the nature of field measurements, it should be noted that results from the Level IV Field-Baseline ERA are likely to be less than definitive in the identification of actual adverse ecological impact(s). Field-baseline assessments may consist of but are not limited to the following methods:
1. Tissue analysis/bioaccumulation studies;
 2. Population/community assays (using appropriate reference sites);
 3. Laboratory Toxicity tests (bioassays); and
 4. In situ Toxicity Tests.
- B. At the conclusion of the level IV Field-Baseline ERA, propose one of the following decisions based on the results:
1. Unacceptable hazards identified (e.g., concentrations above screening levels and/or surface waters fail to meet Water Quality Standards), ERA completed; or
 2. No unacceptable hazard identified (e.g., concentrations below screening levels and surface waters meet Water Quality Standards); ERA completed.
- C. Respondent shall summarize the completed risk assessment and the decision for additional risk assessment if warranted.

- D. Specific requirements for conducting the Level IV Field-Baseline ERA are further described in Chapter 5 of the DERR ECO Guidance. At the conclusion of the Level IV Field-Baseline ERA, Respondent shall submit for review and approval a Level IV Field-Baseline ERA Report consistent with Chapter 5 of the DERR ECO Guidance.

V. Final ERA Report(s)

Respondent shall include all approved ERA Report(s) in the RI Report. Respondent shall ensure that the ERA Report for the highest level of ERA completed also contains all of the information necessary to evaluate the environmental impact of proposed remedial alternatives in the FS. Format for the RI Report is provided below, in Appendix J of this SOW.

Appendix J

I. Draft RI Report Format

A. RI Report Format

The RI Report shall organized as follows:

Executive Summary

1. Introduction
2. Purpose of the Report
3. Site Background
 - a. Site Description
 - b. Site History
 - c. Previous Investigations
 - d. Previous Emergency or Interim Actions
4. Report Organization

B. Study Area Investigation

1. Includes field activities associated with site characterization, including as appropriate physical and chemical monitoring of the following:
 - a. Surface Features (e.g.; topographic mapping, natural and manmade features)
 - b. Contaminant Source Investigations
 - c. Meteorological Investigations
 - d. Surface-water and Sediment Investigations
 - e. Geological Investigations
 - f. Soil and Vadose Zone Investigations
 - g. Ground water Investigations
 - h. Human Population Surveys
 - i. Ecological Investigations

2. Interim Technical Memoranda related to field investigations as revised by Ohio EPA comments, if any, shall be included in an appendix and summarized in this section.

C. Physical Characteristics of the Study Area

1. Includes the results of field activities to determine physical characteristics, including as appropriate the following:
 - a. Surface Features
 - b. Meteorology
 - c. Surface water hydrology
 - d. Geology
 - e. Soils
 - f. Hydrogeology
 - g. Demography and Land use
 - h. Ecology

D. Nature and Extent of Contamination

1. Presents the results of site characterization, both natural and chemical components and contaminants as appropriate in the following media:
 - a. Sources (e.g.; lagoons, sludges, tanks)
 - b. Soils and Vadose Zone
 - c. Ground Water
 - d. Surface Water and Sediments
 - e. Air
 - f. Subsurface Gases

E. Contaminant Fate and Transport

1. Potential Routes of Migration (e.g.; air, ground water, soils)
2. Contaminant Persistence
 - a. As applicable, describe estimated persistence in the study area environment and physical, chemical, and/or biological factors of importance for the media of interest.

3. Contaminant Migration
 - a. Discuss factors affecting contaminant migration for the media of interest (e.g.; sorption onto soils, solubility in water, movement of ground water, etc.).
 - b. Discuss modeling methods and results if applicable.
- F. Baseline Risk Assessments
 1. Human Health Risk Assessment
 - a. Exposure Assessment
 - b. Toxicity Assessment
 - c. Risk Characterization
 2. Final Ecological Risk Assessment
 - a. Level I Scoping ERA Report (included in PER)
 - b. Level II Screening ERA Report (if required)
 - c. Level III Baseline ERA Report (if required)
 - d. Level IV Field-Baseline ERA Report (if required)
- G. Site-Specific PRGs
 1. Site-specific PRGs for protection of human health
 2. Site-Specific PRGs for protection of ecological receptors
- H. Summary and Conclusions
 1. Summary
 - a. Nature and Extent of Contamination
 - b. Fate and transport
 - c. Risk Assessment
 2. Conclusions
 - a. Data Limitations and Recommendations for Future Work
 - b. Revised Remedial Action Objectives

- I. References
- J. Tables and Figures
(At least one set of figures shall be no larger than 11" x 17")
- K. Appendices
 - 1. Log Books
 - 2. Soil Boring Logs
 - 3. Test Pit/Trenching Logs
 - 4. Soil Gas Probe Construction Diagrams
 - 5. Monitoring Well Construction Diagrams
 - 6. Sample Collection Logs
 - 7. Private and public Well Records
 - 8. Technical Memoranda on Field Activities
 - 9. Analytical Data and QA/QC Evaluation Results
 - 10. Human Health Risk Assessment Information
 - 11. Detailed Modeling Reports

Appendix K

Development and Screening of Remedial Alternatives

Respondent shall develop and screen remedial alternatives to arrive at an appropriate range of waste management options for detailed analysis. The range of alternatives shall include: a) options in which treatment is used to reduce the toxicity, mobility, or volume of wastes, but varying in the types of treatment, the amount treated, and the manner in which long-term residuals or untreated wastes are managed; b) options involving containment with little or no treatment; c) options involving both treatment and containment; and d) a no-action alternative. The following activities are to be performed by Respondent during the development and screening of remedial alternatives.

I. Technologies Screening (Section 4.2.2 through 4.2.5.3 of the U.S. EPA RI/FS Guidance)

A. Develop General Response Actions (U.S. EPA RI/FS Guidance 4.2.2)

Respondent shall refine the general response actions initially identified during project scoping. General response actions shall be identified for each medium of interest, describing containment, treatment, excavation, pumping, or other actions, singly or in combination, to satisfy the RAOs.

B. Identify Areas and/or Volumes of Media (U.S. EPA RI/FS Guidance 4.2.3)

Respondent shall identify areas or volumes of media to which general response actions may apply, taking into account requirements for protectiveness as identified in the RAOs, site conditions, and the nature and extent of contamination (Section 4.2.3 of the U.S. EPA RI/FS Guidance).

C. Identify, Screen, and Document Remedial Technologies (U.S. EPA RI/FS Guidance 4.2.4)

Respondent shall identify, screen and evaluate remedial technologies applicable to each general response action to eliminate those that cannot be technically implemented at the Site based on contaminant types and concentrations and/or site characteristics. Decisions made during the remedial technology screening shall be documented for inclusion in the Alternatives Array Document.

D. Evaluate and Document Process Options (U.S. EPA RI/FS Guidance 4.2.5)

Process options for each surviving technology type shall be identified and evaluated on the basis of effectiveness, implementability, and cost as those criteria are defined in Section 4.2.5 of the U.S. EPA RI/FS Guidance. Respondent shall select and retain, wherever possible, one or more representative process options for each implementable technology type. The evaluation should focus on effectiveness factors at this stage with less effort directed at the implementability and cost factors. Identifying and screening process options shall be documented for inclusion in the Alternatives Array Document described under 7.1.5 below. Respondent shall consider the NCP's preference for treatment over conventional containment or land disposal approaches.

II. Alternatives Array (U.S. EPA RI/FS Guidance 4.2.6)

Respondent shall submit for review and comment an AAD consisting of the following:

A. Assemble and Document Alternatives

Respondent shall assemble the selected representative technologies into remedial alternatives. Each alternative should comprehensively address the site-specific PRGs, RAOs, and ARARs. A range of remedial alternatives shall be developed which include combinations of treatment and containment technologies that will address the Site as a whole. Each alternative shall describe the locations of the Site affected; approximate volumes of media to be removed or treated; and any other information needed to adequately describe the alternative and document the logic behind each specific remedial alternative.

B. Conduct and Document the Screening Evaluation of Each Alternative

Respondent may perform, or Ohio EPA may require, that the assembled alternatives undergo a screening process based on short and long term aspects of effectiveness, implementability, and relative cost as those criteria are defined in Section 4.3 of the U.S. EPA RI/FS Guidance. Screening of the alternatives is generally performed when there are many feasible alternatives available for detailed analysis. The screening may be

conducted to assure that only those alternatives with the most favorable composite evaluation of all factors are retained for further analysis, while at the same time preserving an appropriate range of remedial options. Prior to conducting a screening of alternatives, Respondent shall further define the alternatives such that design considerations for technologies, remediation time frames, interactions among media, and site-wide protectiveness aspects of the alternatives are described (ability of the alternative to satisfy all of the RAOs). The purpose shall be to ensure that a basis exists for evaluating and comparing the alternatives before proceeding with the alternative screening step (Section 4.3.1 of the U.S. EPA RI/FS Guidance).

The screening shall preserve the range of treatment and containment alternatives that was initially developed. The range of remaining alternatives shall include options that use treatment technologies and permanent solutions to the maximum extent practicable and minimize inter-media transfer of contaminants. Chemical and physical characterization of the Site shall also be considered by identifying relationships between source areas with ongoing releases and the media affected by the release. Where interactions among media appear to be important, the effect of source control actions on remediation levels or time frames for other media should be evaluated. Respondent shall prepare a summary of the assembled remedial alternatives and their related ARARs, and provide the reasoning employed in the alternative screening. The alternatives summary will be submitted with the Alternatives Array Document.

III. Post-screening Considerations

- A. At the conclusion of the alternative screening phase, or if no screening is needed, Respondent shall determine if the amount and type of data existing for the Site will support the detailed analysis of the surviving remedial alternatives (Section 4.3.3.3 of the U.S. EPA RI/FS Guidance). Specifically, Respondent shall consider whether any additional field investigation or treatability testing is necessary prior to proceeding with the detailed analysis of alternatives. If Respondent determines that additional site data or treatability testing is needed, Respondent shall document the determination, the specific types of data needed; and the time frame for obtaining the data in the AAD. If Ohio EPA concurs with Respondent's determinations, Respondent shall submit for review and approval an addendum to the RI/FS Work Plan and supporting documents and/or a

treatability study work plan for obtaining the additional data. Should Ohio EPA determine, based on review of the AAD, that additional data is needed to perform the detailed analysis of alternatives, Ohio EPA shall notify Respondent of the need for additional data, and Respondent shall submit for review and approval an addendum to the RI/FS Work Plan and supporting documents and/or a Treatability Study Work Plan to obtain the additional data.

Appendix L

Treatability Studies

Treatability Study Work Plan

If the need for treatability studies arises during the conduct of the RI/FS , Respondent shall submit for review and approval a Treatability Study Work Plan prepared in a manner consistent with U.S. EPA's *Guidance for Conducting Treatability Studies Under CERCLA*, EPA/540/R-92/071a, October, 1992 (Treatability Study Guidance). The Treatability Study Work Plan may incorporate by reference approved portions of the RI/FS Work Plan and supporting documents.

I. Data Quality Objectives (Section 3.2 of the Treatability Study Guidance)

Respondent shall establish DQOs for the treatability study and incorporate them into the Treatability Study Work Plan, the study design, the FSP, and the QAPP.

II. The Treatability Study Work Plan shall address the following elements:

A. Project Description

Respondent shall provide background information on the Site and summarize existing waste characterization data (matrix type and characteristics and the concentrations and distribution of the contaminants of concern). Respondent shall also specify the type of study to be conducted, *i.e.*, remedy screening; remedy selection testing; or remedy implementation.

B. Treatment Technology Description

Respondent shall briefly describe the treatment technology to be tested. Respondent may include a flow diagram showing the input stream, the output stream, and any side-streams generated as a result of the treatment process. Respondent shall also include a description of the pre- and post treatment requirements.

C. Test Objectives

Respondent shall define the objectives of the treatability study and the intended use of the data (*i.e.*, to determine potential feasibility; to develop

performance or cost data for remedy selection; or to provide detailed design, cost and performance data for implementation. Respondent shall include performance goals that are based on established cleanup criteria for the Site or, where such criteria do not exist, on contaminant levels that are protective of human health and the environment.

D. Experimental Design and Procedures

For any experimental design, Respondent shall identify the tier and the scale of the testing, the volume of waste material to be tested, the critical parameters, and the type and amount of replication. For the design of the experiment, Respondent must consider the DQOs and the costs associated with replication. Respondent shall describe the specific steps involved in the performance of the treatability study in the standard operating procedures (SOPs). The SOPs should be sufficiently detailed to allow the laboratory or field technician conducting the test to operate the equipment and to collect the samples.

E. Equipment and Materials

Respondent shall list the equipment, materials, and reagents that will be used in the performance of the treatability study, including quantity, volume/capacity, calibration or scale, equipment manufacturer and model numbers, and reagent grades and concentrations.

F. FSP and QAPP

Respondent shall describe how the existing FSP (Section 2.2 and Appendix B of this SOW) and QAPP (Section 2.3 and Appendix C of this SOW) shall be modified or amended to address field sampling, waste characterization, and sampling and analysis activities in support of the treatability study. Respondent shall describe the kinds of samples that will be collected and specify the level of QA/QC required.

G. Data Management

Respondent shall describe the procedures for recording observations and raw data in the field or laboratory. If proprietary processes are involved, Respondent shall describe how confidential information will be handled.

H. Data Analysis and Interpretation

Respondent shall describe the procedures for analyzing and interpreting data from the treatability study, including methods of data presentation and statistical evaluation

I. Health and Safety Plan (HASP)

Respondent shall describe how the existing HASP (Section 2.4 and Appendix D of this SOW) shall be modified or amended to address the hazards associated with treatability testing.

J. Residuals Management

Respondent shall describe the management of treatability study residuals. Respondent should include estimates of both the types and quantities of residuals expected to be generated during treatability testing based on the treatment technology and the experimental design. Respondent shall also outline how treatability study residuals will be analyzed to determine if they are hazardous wastes and discuss how such wastes will be managed.

K. Reports

Respondent shall describe the preparation of interim and final reports documenting the results of the treatability study. For treatability studies involving more than one tier of testing, Respondent shall provide interim reports, which provide a means of determining whether to proceed to the next tier. Respondent shall also describe how the existing monthly progress reports (Section 11 of this SOW) shall be modified or amended to include reporting of treatability study progress.

L. Schedule

Respondent shall include a comprehensive treatability study project schedule indicating critical path dependencies and including dates for the initiation, duration, and completion of each treatability study task. The schedule shall also include field work and development and submittal of required deliverables. To the extent that the performance of the treatability study will impact the RI/FS project schedule (Section 2 of this SOW), Respondent shall submit a revised RI/FS project schedule for review and approval concurrent with the Treatability Study Work Plan.

III. Treatability Study Report Format (Section 3.12 of the Treatability Study Guidance)

Upon completion of the treatability study(ies), Respondent shall submit for review and approval a Treatability Study Report. The report shall be organized as follows:

- A. Introduction
 - 1. Site Description
 - a. Site Name and Location
 - b. History of Operations
 - c. Prior Removal and Remediation Activities
 - 2. Waste Stream Description
 - a. Waste Matrices
 - b. Pollutants/Chemicals
 - 3. Treatment Technology Description
 - a. Treatment Process and Scale
 - b. Operating Features
 - c. Treatment Residuals Management
 - 4. Previous Treatability Studies at the Site
- B. Conclusions and Recommendations
 - 1. Conclusions
 - 2. Recommendations
- C. Treatability Study Approach
 - 1. Test Objectives and Rationale
 - 2. Experimental Design and Procedures
 - 3. Equipment and Materials
 - 4. Sampling and Analysis

- a. Waste stream
 - b. Treatment Process
- 5. Data Management
- 6. Deviations from the Work Plan
- D. Results and Discussion
 - 1. Data Analysis and Interpretation
 - a. Analysis of Waste Stream Characteristics
 - b. Analysis of Treatability Study Data
 - c. Comparison to Test Objectives
 - 2. Quality Assurance/Quality Control
 - 3. Costs/Schedule for Performing the Treatability Study
 - 4. Key contacts

References

Appendices

- A. Data Summaries
- B. Standard Operating Procedures

Appendix M

Feasibility Study (FS) Report

The FS Report consists of the revised AAD and the detailed analysis of the remedial alternatives surviving screening in the revised AAD. The detailed analysis of remedial alternatives shall consist of the following elements:

- I. Detailed Description of Each Alternative (U.S. EPA RI/FS Guidance Sections 6.2.1 to 6.2.4)

The detailed narrative description of each alternative shall include at a minimum:

- A. Description of each technology component;
- B. Refinement of the volumes and/or areas of contaminated media to be addressed;
- C. Special engineering considerations required to implement the alternative, (e.g., pilot treatment facility or additional studies needed to proceed with final remedial design);
- D. Operation, maintenance and monitoring requirements;
- E. Temporary storage requirements;
- F. Health and safety requirements related to implementation and operation and maintenance of the alternative, including on- and off-site (site worker and general public) health and safety considerations;
- G. An analysis of how the alternative could be phased into individual operations and a discussion of how these operations could best be implemented to produce significant environmental improvement;
- H. A review of any off-site treatment or disposal facilities and transportation needs to ensure compliance with the Resource Conservation and Recovery Act, TSCA, and state requirements; and
- I. An analysis of the projected performance and expected results of the alternative with emphasis on potential for further future release of hazardous substances.

II Environmental Impact of alternatives

Respondent shall conduct an assessment of the environmental impact of each alternative, including the impacts of residual contamination and the impact of physical/habitat alterations (e.g., loss of wetlands or riparian habitat due to filling or grading, destruction of benthic substrate, nesting areas). The assessment shall include a discussion of methods for mitigating identified environmental impacts. The environmental impact of each alternative shall then be assessed relative to the other alternatives under consideration.

III. Apply the Eight Criteria and Document the Individual Alternative Analysis

Respondent shall apply the eight evaluation criteria described below to each individual alternative. Respondent shall document the decision making process and the results of the individual analysis of alternatives.

A. Overall Protection of Human Health and the Environment.

Respondent shall assess the alternatives to determine if they can adequately protect human health and the environment from unacceptable risks posed by hazardous substances, pollutants or contaminants present at the Site by eliminating, reducing or controlling exposures to levels established during development of remediation goals. This is a threshold requirement and the primary objective of the remediation program.

B. Compliance with Applicable or Relevant and Appropriate Requirements.

Respondent shall assess the alternatives to determine if they attain applicable or relevant and appropriate standards, criteria and requirements of federal, state, and local laws. This is also a threshold requirement.

C. Long-term Effectiveness and Permanence.

Respondent shall assess the alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will prove successful. Factors that shall be considered include the following:

1. Nature and magnitude of residual risk; potential for exposure of human and environmental receptors; concentrations of hazardous substances, pollutants or contaminants remaining after implementing the remedial alternative, considering the persistence,

toxicity, mobility and propensity to bio-accumulate such hazardous substances and their constituents (see RAGS Part C);

2. The type, degree and adequacy of long-term management required for untreated substances and treatment residuals, including engineering controls (such as containment technologies), institutional controls, monitoring and operation and maintenance;
3. Long-term reliability of the engineering and institutional controls, including uncertainties associated with land disposal of untreated hazardous substances, pollutants, contaminants, and treatment residuals, and;
4. Potential need for replacement of the remedy, and the continuing need for repairs to maintain the performance of the remedy.

D. Reduction of Toxicity, Mobility or Volume Through Treatment

Respondent shall assess the degree to which alternatives employ treatment that reduces toxicity, mobility or volume of contaminants. Respondent shall identify alternatives which, at a minimum, address the principal threats posed by the Site through treatment. Factors that shall be considered include the following:

1. The treatment or recycling processes the alternatives employ and materials they will treat;
2. The amount of hazardous substances, pollutants or contaminants that will be destroyed, treated, or recycled;
3. The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment or recycling and the specifications of which reduction(s) are occurring;
4. The degree to which the treatment is irreversible;
5. The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility and propensity to bio-accumulate;
6. The degree to which treatment will reduce the inherent hazards posed by the principal threats at the Site; and

7. The degree to which the treatment processes employed reduce the transfer of contaminants between environmental media.

E. Short-term Effectiveness

Respondent shall assess the short-term impacts of the alternatives during the construction and implementation phase, and until the objectives of the remedial action have been met. Factors that shall be considered include the following:

1. Short-term risks that may be posed to the community during construction and implementation of an alternative and until the RAOs have been met;
2. Potential impacts on workers during remedial action and with the objectives of remedial action have been met, the effectiveness and reliability of protective measures;
3. Potential environmental impacts that may result from the remedial action and the effectiveness and reliability of mitigative measures during implementation and until the objectives of the remedial action have been met; and
4. Time until response action objectives are achieved.

F. Implementability.

Respondent shall assess the technical and administrative feasibility of implementing the alternatives. Factors that shall be considered include the following:

1. Technical Feasibility:
 - a. Degree of difficulty or uncertainty associated with construction and operation of the alternative;
 - b. Expected operational reliability of the alternative;
 - c. Ease of undertaking additional remedial action(s); and
 - d. Ability to monitor the effectiveness of the remedy.

2. Administrative Feasibility:

- a. Activities needed to coordinate implementation of the remedy with state, local, and federal agencies (e.g., obtaining necessary approvals and permits; right-of-way for construction) and the feasibility of obtaining needed permits; and
- b. Likelihood of property owner to enter into an environmental covenant.

3. Feasibility of Obtaining Services and Materials:

- a. Capacity and location of adequate treatment, storage, and disposal services;
- b. Availability of necessary equipment and specialists and provisions to ensure any necessary additional resources;
- c. Availability of services and materials; and
- d. Availability of prospective technologies

G. Cost

The types of costs that shall be assessed include the following:

- 1. Direct and indirect capital costs, including contingency and engineering fees;
- 2. Annual operation and maintenance costs; and
- 3. Net present value of capital and O&M costs.

H. Community Acceptance.

This criteria is addressed by Ohio EPA throughout the conduct of the RI/FS and during the public comment period for the Preferred Plan by determining which components of the alternatives local government and other interested persons in the community support, have reservations about, or oppose. The assessment of community acceptance of the

preferred remedy is conducted exclusively by Ohio EPA and is not part of this SOW or the Orders.

IV. Compare Alternatives Against Each Other and Document the Comparison of Alternatives (U.S. EPA RI/FS Guidance Sections 6.2.5 and 6.2.6)

At the conclusion of the individual analysis of alternatives, Respondent shall perform a comparative analysis between the alternatives. That is, each alternative will be compared against the others using the eight evaluation criteria as a basis of comparison. Respondent shall document the decision making process and the results of the comparative analysis of alternatives for inclusion in the FS.

Appendix N

RI/FS Submittals

- 1) Pre-investigation Evaluation Report (PER)
- 1) RI/FS Work Plan and Supporting Documents
 - Field Sampling Plan (FSP)
 - Quality Assurance Project Plan (QAPP)
 - Health and Safety Plan (HASP)
- 3) Human Health Risk Assessment Assumptions Document (RAAD)
- 4) ERA Report(s) (as may be required)
 - Level I ERA Report
 - Level II ERA Report
 - Level III ERA Report
 - Level IV ERA Report
- 5) Remedial Investigation Report (RI Report)
- 6) Refined Remedial Action Objectives ITM
- 7) Alternatives Array Document (AAD)
- 8) Feasibility Study Report (FS Report)
- 9) Interim Technical Memoranda (as may be required)
- 10) Treatability Study Work Plan (as may be required)
- 11) Interim Action Work Plan (Addendum to RI/FS Work Plan; as may be required)
- 12) Other addendum(s) to the RI/FS Work Plan and Supporting Documents (as may be required)
- 13) Monthly Progress Reports

Appendix O

Acronym List

AAD	Alternatives Array Document
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
BOD	Biological Oxygen Demand
CDI	Chronic Daily Intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPEC	Chemical of Potential Ecological Concern
CSM	Conceptual Site Model
DQOs	Data Quality Objectives
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
ERfD	Ecological Reference Dose
EHl	Ecological Hazard Index
EHQ	Ecological Hazard Quotient
FS	Feasibility Study
FSP	Field Sampling Plan
HHRA	Human Health Risk Assessment

Contents

HASP	Health and Safety Plan
HI	Hazard Index
HQ	Hazard Quotient
ITM	Interim Technical Memoranda
NCP	National Contingency Plan, Final Rule (40 CFR Part 300)
NPDES	National Pollution Discharge Elimination System
Ohio EPA	Ohio Environmental Protection Agency
O&M	Operation and Maintenance
Orders	Director's Final Findings and Orders
PDF	Portable Document Format
PER	Preinvestigation Evaluation Report
PRGs	Preliminary Remediation Goals
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RAAD	Risk Assessment Assumptions Document
RAGS	Risk Assessment Guidance for Superfund
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation

Contents

RI/FS	Remedial Investigation/Feasibility Study
SCS	Soil Conservation Service
SF	Slope Factor
SOP	Standard Operating Procedure
SOW	Statement of Work
TBC	To Be Considered criteria
TOC	Total Organic Carbon
TSCA	Toxic Substances Control Act
U.S. ACE	United States Army Corps of Engineers
U.S. EPA	United States Environmental Protection Agency

**STATE OF OHIO
MODEL STATEMENT OF WORK FOR
THE REMEDIAL DESIGN AND REMEDIAL ACTION
AT**

[Site Name]
[Site Address]

1.0 PURPOSE

The purpose of this Remedial Design/Remedial Action Statement of Work (RD/RA SOW) is to define the procedures the Respondent(s) shall follow in designing and implementing the selected remedy for the _____ Site as described in this SOW and the Director's Final Findings and Orders (Orders) to which it is attached. The Division of Emergency and Remedial Response (DERR) documented the selection of a remedy for the site in a Decision Document dated _____. The intent of the remedy is to protect the public health and/or the environment from the actual or potential adverse effects of the contaminants discovered at and related to the site. Further guidance for performing the RD/RA work tasks may be found in the U.S. EPA Superfund Remedial Design and Remedial Action Guidance document (OSWER Directive 9355.0-4A). All applicable regulatory requirements pertaining to the selected remedy and RD/RA activities shall be followed.

The Ohio EPA shall provide oversight of the Respondent's activities throughout the RD/RA. The Respondent's shall support the Ohio EPA's initiatives and conduct of activities related to the implementation of oversight activities.

2.0 DESCRIPTION OF THE REMEDIAL ACTION/ PERFORMANCE STANDARDS

Performance standards and specifications of the major components of the remedial action to be designed and implemented by the Respondent(s) are described below. Performance standards shall include cleanup standards, standards of control, quality criteria, and other requirements, criteria or limitations as established in the Decision Document, this SOW and the Orders to which it is attached.

[List each component of the remedy as an individual subsection, i.e. 2.1 Security Fence, 2.2 RCRA Compliant Cap, etc. Each component should be described in sufficient detail so that an assessment can be made of the adequacy of the component. Cleanup standards should be provided for each environmental medium of concern. When appropriate, points of compliance for the cited standards should be specified. Contingencies should also be provided for actions to be taken in the event that cleanup standards cannot be achieved.]

OR

[See Appendix A, Decision Document, for description of the remedial action components and associated performance standards.]

3.0 SCOPE OF THE REMEDIAL DESIGN AND REMEDIAL ACTION

The Remedial Design/Remedial Action (RD/RA) shall consist of seven principal tasks described below. Each task shall be completed and required documentation shall be submitted in accordance with the schedules established in the Orders and in the RD/RA Work Plan approved by Ohio EPA. All work related to this SOW shall be performed by the Respondent(s) in a manner consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended, 42 USC 9601, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300 (1990), and other applicable federal and state rules and regulations.

Task Summary

- 3.1 Task I: RD/RA Work Plan
 - 3.1.1 Site Access
 - 3.1.2 Pre-Design Studies Plan
 - 3.1.3 Regulatory Compliance Plan
 - 3.1.4 Natural Resource Damage Assessment
- 3.2 Task II: Pre-Design Studies
- 3.3 Task III: Remedial Design
 - 3.3.1 General Requirements for Plans and Specifications
 - 3.3.2 Design Phases
 - 3.3.3 Estimated Cost for Remedial Action
 - 3.3.4 Remedial Action Implementation Plan
 - 3.3.5 Community Relations Support
- 3.4 Task IV: Remedial Action Construction
 - 3.4.1 Preconstruction Inspection and Conference
 - 3.4.2 Design Changes During Construction
 - 3.4.3 Remedial Action Construction Completion and Acceptance

- 3.4.4 Community Relations Support
- 3.5 Task V: Five-Year Reviews
- 3.6 Task VI: Operation and Maintenance/Performance Monitoring
 - 3.6.1 Reporting During Operation and Maintenance
 - 3.6.2 Completion of Remedial Action Report
- 3.7 Task VII: Reporting Requirements
 - 3.7.1 Monthly Progress Reports during RD and RA Construction
 - 3.7.2 Summary of Reports and Submittals

3.1 TASK I: RD/RA WORK PLAN

The Respondent(s) shall submit a work plan for the Remedial Design and Remedial Action (RD/RA) to the Ohio EPA for review and approval, which presents the overall strategy for performing the design, construction, operation, maintenance and monitoring of the Remedial Action (RA). The work plan shall provide a detailed discussion of the specific tasks necessary to implement the selected remedy, including a description of the technical approach, personnel requirements, plans, specifications, permit requirements and other reports described in this SOW.

The work plan shall document the responsibilities and authority of all organizations and key personnel involved with the development and implementation of the RD/RA. The qualifications of key personnel directing the RD/RA tasks, including contractor personnel, shall be described.

The work plan shall include schedules fixed in real time for the development of the (RD) and implementation of the RA, including milestones for the submittal of the document packages for Ohio EPA review and meetings for discussion of the submittals. The RD/RA Work Plan must be reviewed and approved by the Ohio EPA prior to initiation of field activities or proceeding with the RD.

Specific requirements to be addressed by the RD/RA Work Plan are described in the following sections.

3.1.1 Site Access

All site access agreements necessary to implement the RD and RA shall be obtained by the Respondent(s) prior to the initiation of any activities to be conducted under the Work Plan. Site access agreements shall extend for the duration of all remedial activities and shall include allowances for all operation and maintenance considerations and State oversight activities. The work plan shall describe the activities necessary to satisfy these requirements.

3.1.2 Pre-Design Studies Plan

The Respondent(s) shall develop a plan to complete the following pre-design studies, which are required to design and fully implement the remedial action.

[Describe any pre-design studies required to support the RD/RA.]

The Pre-Design Studies Plan (PDSP), as a component of the RD/RA Work Plan, will identify and describe, in detail, activities necessary to conduct the pre-design studies identified above. The plan shall include sufficient sampling, testing, and analyses to develop quantitative performance, cost and design data for the selected remedy.

At the discretion of the Site Coordinator for the Ohio EPA, the PDSP may be submitted for review and comment under separate cover from the work plan in accordance with the schedule established in the Orders. The PDSP must be approved by the Ohio EPA prior to initiation of associated field activities or treatability studies.

The Pre-Design Studies Plan shall include, as necessary, a Field Sampling Plan (FSP), a Quality Assurance Project Plan (QAPP) and a Health and Safety Plan (HSP). Section 4.0 of this SOW describes the required content of supporting plans such as the Field Sampling Plans, Quality Assurance Project Plans and Health and Safety Plans.

Prior to development of the Pre-Design Studies Plan, there shall be a meeting of the Site Coordinator for the Ohio EPA and the Project Manager representing the Respondent(s) to discuss scope, objectives, quality assurance and quality control issues, resources, reporting, communication channels, schedule, and roles of personnel involved. Other personnel representing the Respondent(s) and Ohio EPA, who may be needed to fully discuss the issues involved, should also participate in this meeting. Guidance documents to be consulted in developing the Pre-Design Studies Plan include U.S. EPA's Guidance for Conducting Remedial Investigations and Feasibility Studies (EPA/540/G-89/004, October 1988) and Guide for Conducting Treatability Studies Under CERCLA (EPA/540/2-89/058, December 1989), as well as others listed in Appendix A, attached to this SOW.

The pre-design studies will be conducted as described under Task II.

3.1.3 Regulatory Compliance Plan

It shall be the responsibility of the Respondent(s) to ensure compliance with all applicable regulatory state and federal requirements for the RD/RA activities to be conducted at the site. The Respondent(s) shall develop a plan to identify and to satisfy all applicable state and federal laws and regulations for the RD/RA. The plan will include the following information:

- 1) Permitting authorities
- 2) Permits required to conduct RD/RA activities
- 3) Time required by the permitting agency(s) to process permit applications
- 4) Identification of all necessary forms
- 5) Schedule for submittal of applications
- 6) All monitoring and/or compliance testing requirements

The Respondent(s) shall identify in the plan any inconsistencies between any regulatory requirements or permits that may affect any of the work required. The plan shall also include an analysis of the possible effects such inconsistencies may have on the remedial action, recommendations, and supporting rationale for the recommendations. The Regulatory Compliance Plan shall be submitted to the Ohio EPA as part of the RD/RA Work Plan.

3.1.4 Natural Resource Damage Assessment

If natural resources are or may be injured as a result of a release, the Respondent(s) shall ensure that the trustees of the effected natural resources are notified. The trustees will initiate appropriate actions and provide input into the RD/RA in order to minimize or mitigate natural resource damages in accordance with the NCP and 43 CFR part 11. Trustees define "injury" as "a measurable adverse change, either long- or short-term, in the chemical or physical quality of a natural resource resulting either directly or indirectly from exposure to a discharge of oil or release of a hazardous substance. The Respondent(s) shall make available to the trustees all necessary information and documentation needed to assess actual or potential natural resource injuries.

3.2 TASK II: PRE-DESIGN STUDIES

The Respondent(s) shall schedule and detail the work necessary to accomplish the pre-design studies described in the Pre-Design Studies Plan submitted with the RD/RA Work Plan. The requirements of this section shall apply to studies undertaken to refine the understanding of the nature and extent of contamination at the site, as well as to bench and pilot scale treatability studies.

For any such studies required, the Respondent(s) shall furnish all services, including necessary field work, materials, supplies, labor, equipment, supervision, and data

interpretation. Sufficient sampling, testing, and analyses shall be performed to provide the technical data necessary to support the remedial design effort with the goal of optimizing the required treatment and/or disposal operations and systems.

The Respondent(s) shall submit a draft Pre-Design Studies report for Ohio EPA's review and comment when the investigation and/or testing required by the Pre-Design Studies Plan is complete. The draft report shall present investigation/testing data and results along with an analysis of the implications those results have on the RD/RA, including a cost analysis, when appropriate. The draft report shall be submitted prior to the preliminary design submittal in accordance with the schedule specified in the Orders and approved RD/RA Work Plan. After making any required corrections or modifications based on Ohio EPA comments, the Respondent(s) shall submit the final report with the Preliminary Design Report, unless otherwise specified in the approved RD/RA Work Plan.

3.2.1. Reporting Requirements for Groundwater data.

The Respondent(s) shall submit all groundwater data and monitoring well construction data. The Respondent(s) shall implement a groundwater monitoring program as identified in the RD workplan or as required by Ohio EPA. Respondent(s) shall submit all groundwater data and monitoring well construction data on a 3.5 inch diskette using the most current version of the U.S. EPA developed Ground Water Information Tracking System (GRITS) database software. GRITS is free software, and can be obtained by calling EPA office of Research and Development (ORD), at 513-569-7562, ask for Document # EPA/625/11-91/002. Respondent(s) shall submit one copy of each round of sampling data on printed paper in addition to the diskette format. The printed copy will be the official copy of the data.

3.3 TASK III: REMEDIAL DESIGN

The Respondent(s) shall prepare and submit to the Ohio EPA, in accordance with the schedule set forth in the compliance schedule of the Orders, construction plans, specifications and supporting plans to implement the remedial action at the Site as defined in the Purpose and Description of the Remedial Action sections of this SOW, the Decision Document, and/or the Orders.

3.3.1 General Requirements for Plans and Specifications

The construction plans and specifications shall comply with the standards and requirements outlined below. All design documents shall be clear, comprehensive and organized. Supporting data and documentation sufficient to define the functional aspects of the remedial action shall be provided. Taken as a whole, the design documents shall demonstrate that the remedial action will be capable of meeting all objectives of the Decision Document, including any performance standards.

The plans and specifications shall include the following:

- 1) Discussion of the design strategy and design basis including:
 - a. Compliance with requirements of the Decision Document and the Orders and all applicable regulatory requirements;
 - b. Minimization of environmental and public health impacts;
- 2) Discussion of the technical factors of importance including:
 - a. Use of currently accepted environmental control measures and technologies;
 - b. The constructability of the design;
 - c. Use of currently accepted construction practices and techniques;
- 3) Description of the assumptions made and detailed justification for those assumptions;
- 4) Discussion of possible sources of error and possible operation and maintenance problems;
- 5) Detailed drawings of the proposed design including, as appropriate:
 - a. Qualitative flow sheets;
 - b. Quantitative flow sheets;
- 6) Tables listing equipment and specifications;
- 7) Tables giving material and energy balances;
- 8) Appendices including:
 - a. Sample calculations (one example presented and clearly explained for significant or unique calculations);
 - b. Derivation of equations essential to understanding the report;
 - c. Results of laboratory tests, field tests and any additional studies.

3.3.2 Design Phases

The Respondent(s) shall meet when necessary with Ohio EPA representatives to discuss design issues. The design shall be developed and submitted in the phases outlined below to facilitate progression toward an acceptable and functional design.

Submittals shall be made in accordance with the compliance schedule in the Orders, and the schedule in the approved RD/RA Work Plan.

3.3.2.1 Preliminary Design

A Preliminary Design, which reflects the design effort at approximately 30% completion, shall be submitted to the Ohio EPA for review and comment. At this stage of the design process, the Respondent(s) shall have verified existing conditions at the site that may influence the design and implementation of the selected RA. The Preliminary Design shall demonstrate that the basic technical requirements of the remedial action and any permits required have been addressed. The Preliminary Design shall be reviewed to determine if the final design will provide an operable and usable RA that will be in compliance with all permitting requirements and response objectives. The Preliminary Design submittal shall include the following elements, at a minimum:

- Preliminary plans, drawings and sketches, including design calculations;
- Results of treatability studies and additional field sampling;
- Design assumptions and parameters, including design restrictions, process performance criteria, appropriate unit processes for treatment systems, and expected removal or treatment efficiencies for both the process and waste (concentration and volume);
- Proposed cleanup verification methods, including compliance with applicable laws and regulations;
- Outline of design specifications;
- Proposed sitting/locations of processes/construction activity;
- Expected long-term operation and monitoring requirements;
- Real estate and easement requirements;
- Preliminary construction schedule, including contracting strategy.

The supporting data and documentation necessary to define the functional aspects of the RA shall be submitted with the Preliminary Design. The technical specifications shall be outlined in a manner that anticipates the scope of the final specifications. The Respondent(s) shall include design calculations with the Preliminary Design completed to the same degree as the design they support.

If the Pre-Design Studies Report required under Task II have not been submitted prior to submission of the Preliminary Design, it shall be submitted with the Preliminary Design. Any revisions or amendments to the Preliminary Design required by the Ohio EPA shall be incorporated into the subsequent design phase.

3.3.2.2 Intermediate Design

Complex project designs necessitate preparation and Ohio EPA review of design documents between the preliminary and prefinal design phases. The Respondent(s) shall submit intermediate design plans and specifications to the Ohio EPA for review and comment when the design is approximately 60% complete in accordance with the schedule in the approved RD/RA Work Plan. All plans, specifications, design analyses and design calculations submitted to the Ohio EPA shall reflect the same degree of completion. The Respondent(s) shall ensure that any required revisions or amendments resulting from the Ohio EPA's review of the Preliminary Design are incorporated into the Intermediate Design.

The Intermediate Design submittal shall include the following components:

- Design Plans and Specifications;
- Draft Construction Quality Assurance Plan;
- Draft Performance Standard Verification Plan;
- Draft Operation and Maintenance Plan;
- Health and Safety Plan.

The design shall include a Construction Quality Assurance Plan, a Performance Standard Verification Plan, an Operation and Maintenance Plan, and a Health and Safety Plan. The Performance Verification Plan shall include a Field Sampling Plan and a Quality Assurance Project Plan, as necessary. Section 4.0 of this SOW describes the required content of the supporting plans. The final Pre-Design Studies Report shall also be included, if it has not already been submitted. Revisions or amendments to the Intermediate Design required by Ohio EPA shall be incorporated into the Prefinal Design.

3.3.2.3 Prefinal Design

The Respondent(s) shall submit a Prefinal Design for Ohio EPA review in accordance with the schedule in the approved RD/RA Work Plan when the design effort is at least 90% complete. The Respondent(s) shall ensure that any modifications required by the Ohio EPA's prior review of related Pre-design Studies Reports, technical memoranda, the Preliminary and Intermediate Designs, and the QAPP and HSP are incorporated into the Prefinal Design submittal. The Prefinal Design submittal shall consist of the following components, at a minimum:

- Design Plans and Specifications;
- Construction Quality Assurance Plan;
- Performance Standard Verification Plan;
- Operation and Maintenance Plan;
- Remedial Action Implementation Plan;
- Cost Estimate;
- Health and Safety Plan.

General correlation between drawings and technical specifications is a basic requirement of any set of working construction plans and specifications. Before submitting the remedial design specifications with the Prefinal Design, the Respondent(s) shall: (1) Coordinate and cross-check the specifications and drawings; (2) Complete the proofing of the edited specifications and required cross-checking of all drawings and specifications.

The Respondent(s) shall prepare and include in the technical specifications governing any treatment systems; contractor requirements for providing appropriate service visits by qualified personnel to supervise the installation, adjustment, startup and operation of the treatment systems; and appropriate training on operational procedures once startup has been successfully accomplished.

The Ohio EPA will provide written comments to the Respondent(s) indicating any required revisions to the Prefinal Design. Comments may be provided as a narrative report and/or markings on design plan sheets. Revisions to the plans and specifications required by Ohio EPA shall be incorporated into the Final Design. At the discretion of the Site Coordinator, the Respondent(s) shall also return to Ohio EPA all marked-up prints as evidence that the plans have been completely checked. The Prefinal Design submittal may serve as the Final Design, if Ohio EPA has no further comments and notifies the Respondent(s) that the Prefinal Design has been approved as the Final Design.

3.3.2.4 Final Design

Following incorporation of any required modifications resulting from the Ohio EPA's review of the Prefinal Design submittal, the Respondent(s) shall submit to the Ohio EPA the Final Design which is 100% complete in accordance with the approved schedule described in the RD/RA Workplan. The Final Design submittal shall include all the components of the Prefinal Design and each of those components shall be complete. At the discretion

of the Site Coordinator, any marked-up prints or drawings, which the Ohio EPA may have provided by way of comments on previous design submittals shall be returned to the Ohio EPA, if they have not already been returned.

The Respondent(s) shall make corrections or changes based on Ohio EPA comments on the Final Design submittals. The revised Final Design shall then be submitted in their entirety to the Ohio EPA for approval as the completed Final Design. Upon approval of the Site Coordinator, final corrections may be made by submitting corrected pages to the Final Design design documents. The quality of the Final Design submittal should be such that the Respondent(s) would be able to include them in a bid package and invite contractors to submit bids for the construction project.

3.3.3 Estimated Cost of the Remedial Action

The Respondent(s) shall refine the cost estimate developed in the Feasibility Study to reflect the detailed plans and specifications being developed for the RA. The cost estimate shall include both capital and operation and maintenance costs for the entire project. To the degree possible, cost estimates for operation and maintenance of any treatment system shall be based on the entire anticipated duration of the system's operation. The final estimate shall be based on the final approved plans and specifications. It shall include any changes required by the Ohio EPA during Final Design review, and reflect current prices for labor, material and equipment.

The refined cost estimate shall be submitted by the Respondent(s) with the Prefinal Design and the final cost estimate shall be included with the Final Design submittal.

3.3.4 Remedial Action Implementation Plan

The Respondent(s) shall develop a Remedial Action Implementation Plan (RAIP) to help coordinate implementation of the various components of the RA. It shall include a schedule for the RA that identifies timing for initiation and completion of all critical path tasks. The Respondent(s) shall specifically identify dates for completion of the project and major interim milestones in conformance with the approved RD/RA Workplan schedule. The Remedial Action Implementation Plan is a management tool which should address the following topics:

- 1) Activities necessary to fully implement each of the components of the RA;
- 2) How these activities will be coordinated to facilitate construction/implementation in accordance with the approved schedule;
- 3) Potential major scheduling problems or delays, which may impact overall schedule;
- 4) Lines of communication for discussing and resolving problems, should they arise;

- 5) Common and/or anticipated remedies to overcome potential problems and delays.

The Remedial Action Implementation Plan shall be submitted with the Prefinal Design for review and comment by the Ohio EPA. The final plan and RA project schedule shall be submitted with the Final Design for review and approval.

3.3.5 Community Relations Support

A community relations program will be implemented by the Ohio EPA. The Respondent(s) shall cooperate with the Ohio EPA in community relations efforts. Cooperation may include participation in preparation of all appropriate information disseminated to the public, and in public meetings that may be held or sponsored by the Ohio EPA concerning the Site.

3.4 TASK IV: REMEDIAL ACTION CONSTRUCTION

Following approval of the Final Design submittal by the Ohio EPA, the Respondent(s) shall implement the designed remedial action(s) at the Site in accordance with the plans, specifications, Construction Quality Assurance Plan, Performance Standard Verification Plan, Health and Safety Plan, Remedial Action Implementation Plan, Quality Assurance Project Plan, and Field Sampling Plan approved with the final design. Implementation shall include the activities described in the following sections.

3.4.1 Preconstruction Inspection and Conference

The Respondent(s) shall participate in a preconstruction inspection and conference with the Ohio EPA to accomplish the following:

- Review methods for documenting and reporting inspection data;
- Review methods for distributing and storing documents and reports;
- Review work area security and safety protocol;
- Discuss any appropriate modifications to the Construction Quality Assurance Plan to ensure that site specific considerations are addressed. The final CQAP shall be submitted to the Ohio EPA at this time, if it has not already been submitted;
- Introduce key construction contractor, engineering and project management personnel and review roles during construction activities;
- Conduct a site walk-around to verify that the design criteria, plans, and specifications are understood and to review material and equipment storage locations.

The Respondent(s) shall schedule the preconstruction inspection and conference to be held within 10 days of the award of the construction contract. The preconstruction inspection and conference shall be documented by a designated person and minutes shall be transmitted to all parties by the Respondent(s) to all parties in attendance.

3.4.2 Design Changes During Construction

During construction, unforeseen site conditions, changes in estimated quantities of required construction materials and other problems associated with the project are likely to develop. Such changing conditions may require either major or minor changes to the approved final design. Certain design changes will require approval of the Ohio EPA prior to implementation to ensure that the intent and scope of the remedial action is maintained. Changes, which could alter the intent or scope of the RA, may require a revision to the Decision Document and a public comment period. Changes to the remedial design which require Ohio EPA written approval prior to implementation include:

- Those that involve the deletion or addition of a major component of the approved remedy (e.g. changing one treatment system for another; deleting any designed layer of a multi-layer cap);
- Those that result in a less effective treatment for wastes associated with the site;
- Any changes that may result in an increase of the exposure to chemicals of concern and/or risk to human health or the environment as compared to the goals for the completed remedial action as stated in the Orders and this SOW;
- Those that result in a significant delay in the completion of the RA;
- Any other changes that alter or are outside of the scope or intent of the approved remedial design.

Ohio EPA shall be notified of other changes made during construction through daily inspection reports and monthly progress reports.

3.4.3 Remedial Action Construction Completion and Acceptance

As the construction of the remedial action nears completion, the following activities and reporting shall be completed by the Respondent(s) to ensure proper project completion, approval, closeout and transition to the operation and maintenance/monitoring phase.

3.4.3.1 Prefinal Construction Conference

Within seven days of making a preliminary determination that construction is complete, the Respondent(s) shall provide written notification to the Ohio EPA and a prefinal construction conference shall be held with the construction contractor(s) to discuss procedures and requirements for project completion and closeout. The Respondent(s) shall have responsibility for making arrangements for the conference. Participants should include the Project Manager for the Respondent(s), the Site Coordinator for the Ohio EPA, all contractors involved with construction of the remedial action(s) and the remedial design agent (person(s) designed the remedy), if requested.

A list of suggested items to be covered at the conference includes, but is not limited to the following:

- Final Operation and Maintenance (O&M) Plan submission, if it has not been submitted already;
- Cleanup responsibilities;
- Demobilization activities;
- Security requirements for project transfer;
- Prefinal inspection schedule;
- Operator training.

The prefinal conference shall be documented by a designated person and minutes shall be transmitted to all parties in attendance by the Respondent(s).

3.4.3.2 Prefinal Inspection

Following the prefinal construction conference, a prefinal inspection of the project will be conducted. The prefinal inspection will be led by the Ohio EPA with assistance from the party with primary responsibility for construction inspection, if requested.

The prefinal inspection will consist of a walk-through inspection of the entire site. The completed site work will be inspected to determine whether the project is complete and consistent with the contract documents and the approved RD/RA Work Plan. Any outstanding deficient or incomplete construction items should be identified and noted during the inspection.

When the RA includes construction of a treatment system, the facility start-up and "shakedown" shall have been completed as part of the RA. "Shakedown" is considered to be the initial operational period following start-up during which adjustments are made to ensure that the performance standards for the system are reliably being achieved. The contractor shall

have certified that the equipment has performed to meet the purpose and intent of the contract specifications. Retesting shall have been successfully completed where deficiencies were revealed. Such shakedown may take several months. Determination of remedy effectiveness for other types of remedial actions will be based on the Performance Standard Verification Plan (PSVP).

If construction of major components of a remedial action is performed in distinct phases or under separate contracts due to the complex scope of the site remedy, it may be appropriate to conduct the prefinal inspections of those components separately. The approved RAIP should identify those projects and components, which should be handled in that manner.

Upon completion of the prefinal inspection, an inspection report shall be prepared by the Respondent(s) and submitted to Ohio EPA with the minutes from the prefinal conference. A copy of the report will be provided to all parties in attendance at the inspection. The report will outline the outstanding construction items, actions required to resolve those items, completion date for those items and a date for the final inspection. Ohio EPA will review the inspection report and notify the Respondent(s) of any disagreements with it.

3.4.3.3 Final Inspection

Within seven days following completion of any outstanding construction items, the Respondent(s) shall provide written notification to the Ohio EPA and schedule a final inspection. A final inspection will be conducted by the Ohio EPA with assistance from the party having primary responsibility for construction inspection, if requested.

The final inspection will consist of a walk-through inspection of the project site focusing on the outstanding construction items identified during the prefinal inspection. The Prefinal Inspection Report shall be used as a checklist. The contractor's demobilization activities shall have been completed, except for equipment and materials required to complete the outstanding construction items. If any items remain deficient or incomplete, the inspection shall be considered a prefinal inspection requiring another prefinal inspection report and final inspection.

As with the prefinal inspection, it may be appropriate to conduct final inspections of major components of a remedial action separately. Such projects and components should be identified in the approved Remedial Action Implementation Plan.

3.4.3.4 Construction Completion Report and Certification

Upon satisfactory completion of the final inspection, a Construction Completion Report shall be prepared by the Respondent(s) and submitted to the Ohio EPA within 30 days after the final inspection. The report shall include the following elements:

- 1) A brief description of the outstanding construction items from the prefinal inspection and an indication that the items were satisfactorily resolved;
- 2) A synopsis of the work defined in the approved RD/RA Work Plan and the Final Design and certification that this work was performed;
- 3) An explanation of any changes to the work defined in the approved RD/RA Work Plan and Final Design, including as-built drawings of the constructed RA facilities, and why the changes were necessary or beneficial for the project;
- 4) Certification that the constructed RA or component of the RA is operational and functional.

The construction completion report will be reviewed by the Ohio EPA. If Ohio EPA's review indicates that corrections or amendments to the report are necessary, comments will be provided to the Respondent(s). The Respondent(s) shall submit a revised construction completion report based on Ohio EPA comments to the Ohio EPA within 30 days of receipt of those comments. Upon determination by the Ohio EPA that the report is acceptable, written notice of Ohio EPA's approval of the construction completion report will be provided to the Respondent(s).

3.4.4 Community Relations Support

The Respondent(s) shall provide support for Ohio EPA's community relations program during remedial action implementation as described in Section 3.3.5.

3.5 TASK V: FIVE-YEAR REVIEWS

At sites where contaminants will remain at levels that will not permit unrestricted use of the site, a review will be conducted no less frequently than once every five years to ensure that the remedy continues to be protective of human health and the environment. This is known as the "five-year review". The Respondent(s) shall complete Five-Year Review Reports no less often than every five years after the initiation of the remedial action or until contaminant levels allow for unrestricted use of the site. Further guidance for performing five-year review work tasks may be found in the U.S. EPA OSWER Directive 9355.7-02,

Structure and Components of Five-Year Reviews.

The more specific purpose of the reviews is two-fold: (1) to confirm that the remedial action as specified in the Decision Document and as implemented continues to be effective in protecting human health and the environment (e.g., the remedy is operating and functioning as designed, institutional controls are in place and are protective); and (2) to evaluate whether original cleanup levels remain protective of human health and the environment. A further objective is to evaluate the scope of operation and maintenance, the frequency of repairs, changes in monitoring indicators, costs at the site, and how each of these relates to protectiveness.

Fifteen months prior to the due date for completion of a five-year review, the Respondent(s) shall meet with Ohio EPA to discuss the requirements of the five-year review. The review must be completed within five years following the initiation of the remedial action. The scope and level of review will depend on conditions at the site. The scoping effort should include a determination by the Site Coordinator and Respondent(s) as to whether available monitoring data and other documentation will be sufficient to perform the five-year review or whether a field sampling effort will be a necessary component of the review. Within three months of the meeting, the Respondent(s) shall develop and submit a workplan to Ohio EPA that shall describe, at a minimum, the following activities and documentation:

1. Document Review
 - a. Background Information
 1. Decision Document
 2. Decision Document Summary
 3. Administrative or Judicial Order for RD/RA
 4. Completion of Remedial Action Report
 - b. Design Review
 - c. Maintenance and Monitoring
 1. O&M Manual
 2. O&M Reports
 3. Groundwater Monitoring Plan
 4. Monitoring Data and Information
2. Standards Review
 - a. Specific performance standards required by Decision Document
 - b. Changing Standards
 1. Laws and Regulations applicable to conditions and activities at the site
 - c. Risk Assessment
 1. As summarized in the Decision Document
 2. Review for changes in exposure pathways not previously evaluated

3. Interviews
 - a. Background Information
 1. Previous Staff Management
 2. Nearest Neighbors, Respondent(s)
 - b. Local Considerations
 1. State Contacts
 2. Local Government Contacts
 - c. Operational Problems
 1. Plant Superintendent
 2. O&M Contractors
4. Site Inspection/Technology Review
 - a. Performance and Compliance
 1. Visual Inspection
 - b. Offsite Considerations
 - c. Recommendations
5. Report
 - a. Background
 1. Introduction
 2. Remedial Objectives
 3. Review of Applicable Laws and Regulations
 - b. Site Conditions
 1. Summary of Site Visit
 2. Areas of Noncompliance
 - c. Risk Assessment
 - d. Recommendations
 1. Technology Recommendations
 2. Statement on Protectiveness
 3. Timing and Scope of Next Review
 4. Implementation Requirements

If sampling and analysis of environmental samples is required under the five-year review, the Respondent(s) are required to prepare and submit with the workplan other supporting plans. Supporting plans may include a Quality Assurance Project Plan, Field Sampling Plan and Health and Safety Plan. The purpose and content of these supporting plans are discussed in Section 4 of this SOW. The Five-Year Review Workplan must be reviewed and approved by the Ohio EPA prior to initiation of field activities or proceeding with the five-year review.

The Five-Year Review Report will be reviewed by the Ohio EPA. If Ohio EPA's review indicates that corrections or amendments to the report are necessary, comments will be provided to the Respondent(s). The Respondent(s) shall submit a revised Five-Year Review Report based on Ohio EPA comments to the Ohio EPA within 30 days of receipt of those comments.

3.6 TASK VI: OPERATION AND MAINTENANCE/PERFORMANCE MONITORING

The Respondent(s) shall implement performance monitoring and operation and maintenance procedures as required by the approved Performance Standard Verification Plan and approved Operation and Monitoring (O&M) Plan for the RA once it is demonstrated that the RA components are operational and functional.

3.6.1 Reporting During Operation and Maintenance

3.6.1.1 Operation and Maintenance Sampling and Analysis Data

Unless otherwise specified in the approved O&M Plan, sampling, analysis, and system performance data for any treatment system or other engineering systems required to be monitored during the O&M Phase shall be submitted by the Respondent(s) to the Ohio EPA on a monthly basis. These monthly submittals will form the basis for the annual progress report described below in Section 3.6.1.2

3.6.1.2 Progress Reports During Operation and Maintenance

The Respondent(s) shall prepare and submit annual progress reports during the operation and maintenance/performance monitoring phase of the RA. When appropriate, the RD/RA Work Plan shall specify progress reports during O&M to be submitted more frequently.

The O&M progress reports shall contain the same information as required for the monthly progress reports for the RD and RA construction phases, as specified in Section 3.6.1 of this SOW. It shall also include an evaluation of the effectiveness of any treatment and engineering systems in meeting the cleanup standards, performance standards and other goals of the RA as defined in the Orders, this SOW, the RD/RA Work Plan and the approved Final Design.

3.6.2 Completion of Remedial Action Report

At the completion of the remedial action, the Respondent(s) shall submit a Completion of Remedial Action Report to the Ohio EPA. The RA shall be considered complete when all of the goals, performance standards and cleanup standards for the RA as stated in the Decision Document, this SOW, and the approved Final Design (including changes approved during construction) have been met. The report shall document that the project is consistent with the design specifications, and that the RA was performed to meet or exceed all required goals, cleanup standards and performance standards. The report shall include, but not be limited to the following elements:

- 1) Synopsis of the remedial action and certification of the design and construction;
- 2) Listing of the cleanup and performance standards as established in the Decision Document and the Orders, any amendments to those standards with an explanation for adopting the amendments;
- 3) Summary and explanation of any changes to the approved plans and specifications. An explanation of why the changes were necessary should be included and, where necessary, Ohio EPA approval of the changes should be documented;
- 4) Summary of operation of treatment systems including monitoring data, indicating that the remedial action met or exceeded the performance standards or cleanup criteria;
- 5) Explanation of any monitoring and maintenance activities to be undertaken at the site in the future as outlined in Section 3.0 of this RD/RA SOW.

3.7 TASK VII: REPORTING REQUIREMENTS

The Respondent(s) shall prepare and submit work plans, design plans, specifications, and reports as set forth in Tasks I through V of this SOW to document the design, construction, operation, maintenance, and performance monitoring of the remedial action. Monthly progress reports shall be prepared, as described below, to enable the Ohio EPA to track project progress.

3.7.1 Monthly Progress Reports during RD and RA Construction

The Respondent(s) shall at a minimum provide the Ohio EPA with monthly progress reports during the design and construction phases of the remedial action containing the information listed below. When appropriate, the RD/RA Work Plan shall specify progress reports to be submitted more frequently.

- 1) A description of the work performed during the reporting period and estimate of the percentage of the RD/RA completed
- 2) Summaries of all findings and sampling during the reporting period
- 3) Summaries of all changes made in the RD/RA during the reporting period, indicating consultation with Ohio EPA and approval by the Ohio EPA of those changes, when necessary
- 4) Summaries of all contacts with representatives of the local community, public interest groups or government agencies during the reporting period
- 5) Summaries of all problems or potential problems encountered during the reporting period, including those which delay or threaten to delay completion of project milestones with respect to the approved work plan schedule or RAIP schedule
- 6) Summaries of actions taken and being taken to rectify problems
- 7) Summaries of actions taken to achieve and maintain cleanup standards and performance standards

- 8) Changes in personnel during the reporting period
- 9) Projected work for the next reporting period
- 10) Copies of daily reports, inspection reports, sampling data, laboratory/monitoring data, etc.

3.7.2 Summary of Reports and Submittals

A summary of the information reporting requirements contained in this RD/RA SOW is presented below:

- **Draft RD/RA Work Plan**
Health and Safety Plan (HSP)
Regulatory Compliance Plan
- **Final RD/RA Work Plan**
HSP
Regulatory Compliance Plan
- **Draft Pre-Design Studies Plan**
Quality Assurance Project Plan (QAPP)
Field Sampling Plan (FSP)
- **Final Pre-Design Studies Plan**
QAPP
FSP
- **Pre-Design Studies Reports - Draft**
- **Preliminary Design Documents**
- **Pre-Design Studies Reports - Final**
- **Intermediate Design Documents**
Draft Construction Quality Assurance Plan (CQAP)
Draft Performance Standard Verification Plan (PSVP)
Draft O & M Plan
Health and Safety Plan
- **Prefinal Design Documents**
CQAP
PSVP
O & M Plan
Draft Remedial Action Implementation Plan (RAIP)
Health and Safety Plan
- **Final Design Documents**
CQAP
PSVP
O & M Plan
Draft RAIP
Health and Safety Plan
- **Preconstruction Inspection and Conference Report**
- **Monthly Progress Reports During RD/RA**
- **Notification of Preliminary Completion of Construction**

- Final O & M Plan
- Prefinal Inspection Report
- Notification for Final Inspection
- Construction Completion Report
- O & M Sampling Data
- Progress Reports during O&M/Performance Monitoring period
- Completion of Remedial Action Report
- Five-Year Review Workplan
- Five-Year Review Report

4.0 CONTENT OF SUPPORTING PLANS

The documents listed in this section shall be prepared and submitted as outlined in Section 3.0 of this SOW to support the activities necessary to design and fully implement the RA. These supporting documents include a Quality Assurance Project Plan (QAPP), a Field Sampling Plan (FSP), a Health and Safety Plan (HSP), a Construction Quality Assurance Plan (CQAP) and a Performance Standard Verification Plan (PSVP). The following sections describe the required contents of each of these supporting documents.

4.1 QUALITY ASSURANCE PROJECT PLAN

The Respondent(s) shall prepare a site-specific Quality Assurance Project Plan (QAPP) to cover sample analysis and data handling based on guidance provided by the Ohio EPA. Refer to the list of Ohio EPA and U.S. EPA guidance documents in Appendix B attached to the Orders.

A QAPP shall be developed for any sampling and analysis activities to be conducted as predesign studies and submitted with the Pre-Design Studies Plan for Ohio EPA review and approval.

During the remedial design phase the Respondent(s) shall review all remedial design information and modify or amend the QAPP developed for the Pre-Design Studies Plan, as necessary, to address the sampling and analysis activities to be conducted during implementation of the Remedial Action, including activities covered by the PSVP and O&M Plan. An amended QAPP shall be submitted with the Intermediate Design documents for review and comment by Ohio EPA. A final Quality Assurance Project Plan, which incorporates comments made by the Ohio EPA, shall be submitted for approval with the Final Design documents. Upon agreement of the Site Coordinator, the Respondent(s) may submit only the amended portions of the QAPP developed for the PDSP with the Intermediate, Pre-Final and Final Design documents.

The Respondent(s) shall schedule and attend a pre-QAPP meeting with representatives of Ohio EPA to discuss the scope and format of the QAPP. For sites where the Site Coordinator and Project Manager agree that a pre-QAPP meeting is not needed, this meeting may be omitted. The QAPP shall, at a minimum, include:

1. Data Collection Strategy - The strategy section of the QAPP shall include but not be limited to the following:
 - a. Description of the types and intended uses for the data, relevance to remediation or restoration goals, and the necessary level of precision, accuracy, and statistical validity for these intended uses;
 - b. Description of methods and procedures to be used to assess the precision, accuracy and completeness of the measurement data;
 - c. Description of the rationale used to assure that the data accurately and precisely represent a characteristic of a population, variation of physical or chemical parameters throughout the Site, a process condition or an environmental condition. Factors which shall be considered and discussed include, but are not limited to
 - i) Environmental conditions at the time of sampling;
 - ii) Sampling design (including number, location and distribution);
 - iii) Representativeness of selected media, exposure pathways, or receptors; and
 - iv) Representativeness of selected analytical parameters.
 - v) Representativeness of testing procedures and conditions; and
 - vi) Independence of background or baseline from site influences.
 - d. Description of the measures to be taken to assure that the following data sets can be compared quantitatively or qualitatively to each other:
 - i) RD/RA data collected by the Respondent over some time period;
 - ii) RD/RA data generated by an outside laboratory or consultant employed by the Respondent versus data collected by the Respondent, and;
 - iii) Data generated by separate consultants or laboratories over some time period not necessarily related to the RD/RA effort.
 - iv) Data generated by Ohio EPA or by an outside laboratory or consultant employed by Ohio EPA;
 - e. Details relating to the schedule and information to be provided in quality assurance reports. These reports should include but not be limited to:
 - i) Periodic assessment of measurement data accuracy, precision and completeness;
 - ii) Results of performance audits;
 - iii) Results of system audits;
 - iv) Significant quality assurance problems and recommended solutions; and
 - v) Resolutions of previously stated problems.
2. Sample Analysis - The Sample Analysis section of the Quality Assurance Project Plan shall specify the following:
 - a. Chain-of-custody procedures, including:

- i) Identification of a responsible party to act as sample custodian at the laboratory facility authorized to sign for incoming field samples, obtain documents of shipment and verify the data entered onto the sample custody records;
 - ii) Provision for a laboratory sample custody log consisting of serially numbered lab-tracking report sheets; and
 - iii) Specification of laboratory sample custody procedures for sample handling, storage and dispersement for analysis.
 - b. Sample storage procedures and storage times;
 - c. Sample preparation methods;
 - d. Analytical procedures, including:
 - i) Scope and application of the procedure;
 - ii) Sample matrix;
 - iii) Potential interferences;
 - iv) Precision and accuracy of the methodology;
 - v) Method detection limits;
 - vi) Special analytical services required to ensure contract required detection limits do not exceed known toxicity criteria; and
 - vii) Verification and reporting of tentatively identified compounds.
 - e. Calibration procedures and frequency;
 - f. Data reduction, validation and reporting;
 - g. Internal quality control checks, laboratory performance and systems audits and frequency, including:
 - i) Method blank(s);
 - ii) Laboratory control sample(s);
 - iii) Calibration check sample(s);
 - iv) Replicate sample(s);
 - v) Matrix-spiked sample(s);
 - vi) "Blind" quality control sample(s);
 - vii) Control charts;
 - viii) Surrogate samples;
 - ix) Zero and span gases; and
 - x) Reagent quality control checks.
 - h. Preventative maintenance procedures and schedules;
 - i. Corrective action (for laboratory problems); and
 - j. Turnaround time.
- 3. Modeling - The Modeling section of the Quality Assurance Project Plan shall apply to all models used to predict or describe fate, transport or transformation of contaminants in the environment and shall discuss:
 - a. Model assumptions and operating conditions;
 - b. Input parameters; and
 - c. Verification and calibration procedures.
- 4. In Situ or Laboratory Toxicity Tests - The Toxicity Test section of the Quality Assurance Project Plan shall apply to all tests or bioassays used to predict or

describe impacts of contaminants on a population, community, or ecosystem level.

5. Data Record - The QAPP shall also provide the format to be used to present the raw data and the conclusions of the investigation, as described in a, b, and c below:
 - a. The data record shall include the following:
 - i) Unique sample or field measurement code;
 - ii) Sampling or field measurement location and sample or measurement type;
 - iii) Sampling or field measurement raw data;
 - iv) Laboratory analysis ID number;
 - v) Property or component measured; and
 - vi) Result of analysis (e.g., concentration).
 - b. Tabular Displays - The following data shall be presented in tabular displays:
 - i) Unsorted (raw) data;
 - ii) Results for each medium, organism, or for each constituent measured;
 - iii) Data reduction for statistical analysis;
 - iv) Sorting of data by potential stratification factors (e.g., location, soil layer, topography, vegetation form);
 - v) Summary data (i.e., mean, standard deviation, min/max values, and sample number); and
 - vi) Comparisons with background or reference data.
 - c. Graphical Displays - The following data shall be presented in graphical formats (e.g., bar graphs, line graphs, area or plan maps, isopleth plots, cross-sectional plots or transects, three dimensional graphs, etc.):
 - i) Display sampling locations and sampling grid;
 - ii) Indicate boundaries of sampling area, and areas where more data are required;
 - iii) Display levels of contamination at each sampling location or location from which organism was taken;
 - iv) Display geographical extent of contamination;
 - v) Display contamination levels, averages and maxima;
 - vi) Illustrate changes in concentration in relation to distance from the source, time, depth or other parameters;
 - vii) Indicate features affecting intramedia transport and show potential receptors;
 - viii) Compare nature and extent of contamination with results of ecological or biological sampling or measurements; and
 - ix) Display comparisons with background or reference analyses or measurements.

4.2 FIELD SAMPLING PLAN

1. Sampling - The Sampling section of the Field Sampling Plan shall discuss:
 - a. Sufficient preliminary sampling to ensure the proper planning of items b through o. below;
 - b. Selecting appropriate sampling locations, depths, vegetation strata, organism age, etc. and documenting relevance of sample for intended biological toxicity tests or analyses;
 - c. Providing a sufficient number of samples to meet statistical or other data useability objectives;
 - d. Measuring all necessary ancillary data such as ambient conditions, baseline monitoring, etc.;
 - e. Determining environmental conditions under which sampling should be conducted;
 - f. Determining which media, pathways, or receptors are to be sampled (e.g., ground water, air, soil, sediment, biota, etc.);
 - g. Determining which parameters are to be measured and where;
 - h. Selecting the frequency and length of sampling period;
 - i. Selecting the sample design (e.g., composites, grabs, random, repeated, etc.);
 - j. Selecting the number, location, media or organisms for determining background conditions or reference conditions (refer to Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, December 1989);
 - k. Measures to be taken to prevent contamination of the sampling equipment and cross contamination between sampling points;
 - l. Documenting field sampling operations and procedures, including:
 - i) Documentation of procedures for preparation of reagents or supplies which become an integral part of the sample (e.g., filters and adsorbing reagents);
 - ii) Procedures and forms for recording the exact location and specific considerations associated with sample acquisition;
 - iii) Documentation of specific sample preservation method,
 - iv) Calibration of field devices;
 - v) Collection of replicate and field duplicate samples;
 - vi) Submission of field-biased and equipment blanks, where appropriate;
 - vii) Potential interferences present at the site or facility;
 - viii) Construction materials and techniques associated with monitoring wells and piezometers;
 - ix) Field equipment listing and sample containers;
 - x) Sampling order; and
 - xi) Decontamination procedures.
 - m. Selecting appropriate sample containers;

- n. Sample preservation, and
 - o. Chain-of-custody, including:
 - i) Standardized field tracking reporting forms to establish sample custody in the field prior to and during shipment;
 - ii) Sample sealing, storing and shipping procedures to protect the integrity of the sample; and,
 - iii) Pre-prepared sample labels containing all information necessary for effective sample tracking.
2. Field Measurements - The Field Measurements section of the Field Sampling Plan shall discuss:
- a. Selecting appropriate field measurement locations, depths, organism age etc.;
 - b. Providing a sufficient number of field measurements that meet statistical or data useability objectives;
 - c. Measuring all necessary ancillary data such as ambient or baseline environmental conditions;
 - d. Determining conditions under which field measurement should be conducted;
 - e. Determining which media, pathways, or receptors are to be addressed by appropriate field measurements (e.g., ground water, air, soil, sediment, biota, etc.);
 - f. Determining which physical, chemical, or biological parameters are to be measured and where;
 - g. Selecting the frequency and duration of field measurement; and
 - h. Documenting field measurement operations and procedures, including:
 - i) Procedures and forms for recording raw data and the exact location, time and Site specific considerations associated with the data acquisition;
 - ii) Calibration of field devices;
 - iii) Collection of replicate measurements;
 - iv) Submission of field-biased blanks, where appropriate;
 - v) Potential interferences present at the Site;
 - vi) Construction materials and techniques associated with monitoring wells and piezometers used to collect field data;
 - vii) Field equipment listing;
 - viii) Order in which field measurements were made; and
 - ix) Decontamination procedures; and
 - i) Selecting the number, location, media, and organisms for determining background or reference conditions.

4.3 SITE HEALTH AND SAFETY PLAN

The Respondent(s) shall submit a Health and Safety Plan (HSP) to the Ohio EPA with the RD/RA Work Plan for any on-site activities taking place during the design phase. The Respondent(s) shall review the remedial design information and modify the HSP developed for the RD/RA Work Plan, as necessary, to address the activities to be conducted on the site during implementation of the Remedial Action. It shall be designed to protect on-site personnel and area residents from physical, chemical and other hazards posed by the construction, operation and maintenance activities of the Remedial Action.

The Respondent(s) shall prepare a site HSP which is designed to protect on-site personnel and area residents from physical, chemical and all other hazards posed by RD/RA activities. The HSP shall address the following topics:

1. Major elements of the Health and Safety Plan shall include:
 - a. Facility or site description including availability of resources such as roads, water supply, electricity and telephone service;
 - b. Description of the known hazards and an evaluation of the risks associated with the incident and with each activity conducted;
 - c. Listing of key personnel (including the site safety and health officer) and alternates responsible for site safety, response operations, and for protection of public health;
 - d. Delineation of work area, including a map;
 - e. Description of levels of protection to be worn by personnel in the work area;
 - f. Description of the medical monitoring program for on-site responders;
 - g. Description of standard operating procedures established to assure the proper use and maintenance of personal protective equipment;
 - h. The establishment of procedures to control site access;
 - i. Description of decontamination procedures for personnel and equipment;
 - j. Establishment of site emergency procedures;
 - k. Availability of emergency medical care for injuries and toxicological problems;
 - l. Description of requirements for an environmental monitoring program. (This should include a description of the frequency and type of air and personnel monitoring, environmental sampling techniques and a description of the calibration and maintenance of the instrumentation used.);
 - m. Specification of any routine and special training required for responders; and
 - n. Establishment of procedures for protecting workers from weather related problems.

2. The Health and Safety Plan shall be consistent with:
 - a. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985);
 - b. CERCLA Sections 104(f) and 111(c)(6)
 - c. EPA Order 1440.3 -- Respiratory Protection;
 - d. EPA Order 1440.2 -- Health and Safety Requirements for Employees Engaged in Field Activities;
 - e. EPA Occupational Health and Safety Manual;
 - f. EPA Interim Standard Operating Safety Procedures and other EPA guidance as developed by EPA;
 - g. OSHA regulations particularly in 29 CFR 1910 and 1926;
 - h. State and local regulations; and
 - i. Site or facility conditions.

4.4 CONSTRUCTION QUALITY ASSURANCE PLAN

The Respondent(s) shall develop a Construction Quality Assurance Plan (CQAP) based on the plans and specifications and performance standards for the RA. The CQAP is a site specific document that shall specify procedures to ensure that the completed remedial action work meets or exceeds all design criteria and specifications. A draft CQAP shall be submitted with the Intermediate Design submittal for review and comment by the Ohio EPA. Subsequent drafts shall be submitted with the Prefinal and Final Design submittals that incorporate comments made by the Ohio EPA. Certain aspects of the CQAP, for example personnel names and qualifications, may not be known at the time of design approval. A complete and final CQAP shall be submitted to Ohio EPA for approval prior to the start of construction. At a minimum, the CQAP shall address the elements listed below.

4.4.1 Responsibility and Authority

The responsibility and authority of all organizations (i.e. technical consultants, construction firms, etc.) and key personnel involved in the construction of the remedial action(s) shall be described fully in the CQAP. The Respondent(s) shall provide a copy of the approved CQAP to each organization with responsibility and authority for implementing the CQAP. The Respondent(s) shall also identify a CQA officer and the necessary supporting inspection staff.

4.4.2 Construction Quality Assurance Personnel Qualifications

The qualifications of the Construction Quality Assurance officer and supporting inspection personnel shall be presented in the CQAP to demonstrate that they possess the training and experience necessary to fulfill their identified responsibilities.

4.4.3 Inspection Activities

The observations and tests that will be used to monitor the construction and/or installation of the components of the remedial action shall be described in the CQAP. The plan shall include scope and frequency of each type of inspection. Inspections shall verify compliance with the design, applicable requirements of state and federal law and performance standards. Inspections shall also ensure compliance with all health and safety standards and procedures. The CQAP shall include provisions for conducting the preconstruction, prefinal and final inspections and associated meetings as described in Section 5.4 of this SOW.

4.4.4 Sampling Requirements

The sampling activities necessary to ensure that the design specifications and performance standards are achieved shall be presented in the CQAP. The description of these activities shall include sample sizes, sample locations, frequency of sampling, testing to be performed, acceptance and rejection criteria, and plans for correcting problems as addressed in the design specifications.

4.4.5 Documentation

Reporting requirements for CQA activities shall be described in detail in the CQAP. This shall include such items as daily summary reports, meeting reports, inspection data sheets, problem identification and corrective measures reports, design acceptance reports and final documentation. Provisions for the storage of all records shall be presented in the CQAP.

4.5 PERFORMANCE STANDARD VERIFICATION PLAN

A Performance Standard Verification Plan (PSVP) shall be prepared to consolidate information for required testing, sampling and analyses to ensure that both short-term and longterm performance standards for the RA are met. Performance standards may include clean-up standards for contaminated environmental media as well as the measurement of the effectiveness of engineering controls or other controls used to control migration of or exposure to contaminants. For example, the containment of a plume of contaminated ground water by pumping wells would be a performance standard requiring verification. The PSVP should describe the measurements to be taken, such as water levels in monitoring wells and piezometers, along with any analyses to be conducted on the data obtained, such as ground water modeling, to verify that the plume is contained. The PSVP shall include a FSP and a QAPP for any sampling and analyses to be conducted.

The Draft PSVP shall be submitted with the Intermediate Design for review and comment by the Ohio EPA. The final PSVP, which fully addresses comments made by the Ohio EPA must be submitted with and approved as part of the Final Design.

4.6 OPERATION AND MAINTENANCE PLAN

The Respondent(s) shall prepare an Operation and Maintenance Plan (O&M Plan) to cover long term operation and maintenance of the RA. Operation and maintenance for all components of the remedial action, shall begin after it is demonstrated that those components are operational and functional. The plan, at a minimum, shall be composed of the elements listed below.

1. Normal Operation and Maintenance
 - a. Description of tasks for operation
 - b. Description of tasks for maintenance
 - c. Description of prescribed treatment or operating conditions
 - d. Schedules showing the frequency of each O&M task
2. Potential Operating Problems
 - a. Description and analysis of potential operating problems
 - b. Sources of information regarding potential operating problems
 - c. Description of means of detecting problems in the operating systems
 - d. Common remedies for operating problems
3. Routine Monitoring and Laboratory Testing
 - a. Description of monitoring tasks
 - b. Description of required laboratory tests and interpretation of test results
 - c. Required QA/QC procedures to be followed
 - d. Schedule of monitoring frequency and provisions to discontinue, if appropriate

Note: Information on monitoring and testing that is presented in the PSVP should be referenced, as appropriate, but should not be duplicated in the O&M Plan.

4. Alternative O&M
 - a. Description of alternate procedures to prevent undue hazard, should systems fail
 - b. Analysis of the vulnerability and additional resources requirements should a failure occur
5. Safety Plan
 - a. Description of safety procedures, necessary equipment, etc. for site personnel
 - b. Description of safety tasks required in the event of systems failure (may be linked to the Site Safety Plan developed for the RD/RA)

6. Equipment
 - a. Description of equipment necessary to the O&M Plan
 - b. Description of installation of monitoring components
 - c. Description of maintenance of site equipment
 - d. Replacement schedule for equipment and installed components
7. Annual O&M Budget
 - a. Costs for personnel
 - b. Costs for preventative and corrective maintenance
 - c. Costs of equipment and supplies, etc.
 - d. Costs of any contractual obligations (e.g., lab expenses)
 - e. Costs of operation (e.g., energy, other utilities, etc.)
8. Records and Reporting Mechanisms Required
 - a. Daily operating logs
 - b. Laboratory records
 - c. Records for operating costs
 - d. Mechanism for reporting emergencies
 - e. Personnel and maintenance records
 - f. Monthly/semi-annual reports to Ohio EPA

The Respondent(s) shall submit a draft O&M Plan to the Ohio EPA for review and comment with the Intermediate Design submittal. Subsequent drafts of the O&M Plan shall be submitted with the Prefinal and Final Design submittals, which reflect the refined plans and specifications of those submittals and any comments made by the Ohio EPA. The final O&M Plan shall be submitted by the Respondent(s) prior to or at the completion of construction of the remedial action and shall incorporate any modifications or corrections required by the Ohio EPA.

(RI/FS)

**LIST OF GUIDANCE DOCUMENTS AND REFERENCES
FOR USE WITH OHIO EPA DERR REMEDIAL RESPONSE PROGRAM
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
STATEMENT OF WORK AND ORDERS**

Statement of Purpose and Use of This Guidance Document List:

The purpose of this list of Ohio EPA and U.S. EPA policies, directives and guidance documents is to provide a reference of the documents which provide direction and guidance for conducting investigations and evaluating alternative remedial actions at Remedial Response sites. The listed documents incorporate by reference any documents listed therein. Certain sites may have contaminants or conditions which are not fully addressed by the documents in this list. There is an evolving body of policy directives, guidance and research documentation which should be used, as needed, to address circumstances not encompassed by the documents in this list. For sites where activities are conducted in response to an administrative or judicial order, this list will be an attachment to the order and will govern the work conducted. When entering into or issuing an order for any site, Ohio EPA reserves the right to modify this list to fully address the site conditions.

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**LIST OF GUIDANCE DOCUMENTS AND REFERENCES
FOR USE WITH OHIO EPA DERR REMEDIAL RESPONSE PROGRAM
REMEDIAL DESIGN/REMEDIAL ACTION
STATEMENT OF WORK AND ORDERS**

Statement of Purpose and Use of This Guidance Document List:

The purpose of this list of Ohio EPA and U.S. EPA policies, directives and guidance documents is to provide a reference of the primary documents which provide direction and guidance for designing and implementing selected remedial actions at Remedial Response sites. *The listed documents incorporate by reference any documents listed therein.* Certain sites may have contaminants or conditions which are not fully addressed by the documents in this list. There is an evolving body of policy directives, guidance and research documentation which should be used, as needed, to address circumstances not encompassed by the documents in this list. For sites where activities are conducted in response to an administrative or judicial order, this list will be an attachment to the order and will govern the work conducted. When entering into or issuing an order for any site, Ohio EPA reserves the right to modify this list to fully address the site conditions.

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DEED NOTICE TEMPLATE

THIS DEED NOTICE ON REAL PROPERTY ("Notice") is made on this ____ day of _____, 20__, by [insert the name of the titled Property Owner] whose address is _____ ("Declarant").

WITNESSETH:

WHEREAS, Declarant is the owner of real property more particularly described on the attached Exhibit A [requires a legal description] and identified as [insert location of property including parcel numbers, street address, County of _____] State of Ohio ("the Property"); and

WHEREAS, the Property is subject to Director's Final Findings and Orders (Orders) for [Choose one: Remedial Design and Remedial Action ("RD/RA"), or Remedial Investigation and Feasibility Study ("RI/FS"), or Interim Action ("IA")] issued to [Identify the Respondent] by Ohio Environmental Protection Agency (Ohio EPA) on _____. A copy of the Orders may be obtained by contacting Ohio EPA's Division of Emergency and Remedial Response at the [Insert name of appropriate District office including address and telephone number]; and

WHEREAS, the purpose of the Orders is [Insert details from objectives in the Orders]. [If RD/RA Deed Notice, insert: The final remedy is set forth in the Decision Document dated _____. The final remedy includes the following elements: (Identify the primary elements of the remedy)] Please contact the [Insert the name of Respondent/property owner] for additional information.

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Disclaimer: Please note that web links are not maintained.

April 24, 2007 edition

[If applicable, may insert: "**WHEREAS**, at the time this notice was recorded, the monitoring, treatment and containment devices/systems depicted on Exhibit B (attach map) are present and must not be adversely affected."]

For as long as the Property is subject to the Orders as described herein, each instrument hereafter conveying any interest in the Property, or any portion of the Property shall contain a recital acknowledging this Deed Notice and providing the recording location of this Deed Notice upon such conveyance substantially in the following form: "The real property described herein is subject to Ohio EPA Director's Final Findings and Orders issued on _____, 20__ as stated in the Deed Notice recorded in the _____ County Deed Records on _____, 20__ at [insert location of the Deed Notice (e.g., "Volume __, Page __" or "Document Number ____")]" as if the same were fully set forth herein."

[Name of Property Owner]

BY: _____

[Type name of authorized signatory]

TITLE: _____

DATE: _____

STATE OF _____)

) SS:

COUNTY OF _____)

BEFORE ME, a Notary Public in and for said County and State, personally came
_____ by _____, its
_____ who acknowledged that he/she did sign the foregoing Deed
Notice as [*Choose one: owner, or authorized representative, or an officer of said
company*] and that the same is his/her voluntary act, [Insert if applicable: and the
voluntary act of said company]. In testimony whereof, I have subscribed my name and
affixed my seal on this _____ of _____, 20__.

NOTARY PUBLIC
My commission expires:

[3/4/05 revised draft]

[ENVIRONMENTAL COVENANT TEMPLATE]

To be recorded with Deed
Records - ORC § 317.08

ENVIRONMENTAL COVENANT

This Environmental Covenant is entered into by _____ ("Owner")
[name all Owners of the Property and add other "Holders," if any] and the Ohio
Environmental Protection Agency ("Ohio EPA") pursuant to Ohio Revised Code ("ORC")
§§ 5301.80 to 5301.92 for the purpose of subjecting the Property to the activity and use
limitations set forth herein.

*[Insert appropriate background information here, using available program-specific
guidance. Identify the "site" or "facility." Describe the "environmental response
project," see ORC § 5301.80(E), and identify the name and location of the
administrative record for the project. See ORC § 5301.82(A)(8). See also ORC §
5301.82(B)(2) re: description of contamination on or underlying the property and
its remedy, including the contaminants of concern, the pathways of exposure,
limits on exposure, and the location and extent of the contamination.]*

Now therefore, Owner[s] [name all Owners of the Property and add other
"Holders," if any] and Ohio EPA agree to the following:

1. Environmental Covenant. This instrument is an environmental covenant
developed and executed pursuant to ORC §§ 5301.80 to 5301.92.
2. Property. This Environmental Covenant concerns [an approximately
acre tract of real property; OR real property parcels numbered _____]
owned by _____, located at _____, in
County, Ohio, and more particularly described in Exhibit A attached
hereto and hereby incorporated by reference herein ("Property").
3. Owner[s]. _____ ("Owner[s]") [who resides; OR which is
located] at _____, _____, _____ is the
owner of the Property.
4. Holder[s]. Owner[s], whose address is listed above, [and _____]

{who resides; OR which is located} at _____,
_____, _____] [is/are] the holder[s] of this Environmental
Covenant.

5. Activity and Use Limitations. As part of the [closure of hazardous waste management units; corrective action at the Property; remedial action described in the Decision Document; voluntary action described in the NFA Letter; wetlands mitigation project; supplemental environmental project, etc.], Owner[s] hereby impose[s] and agree[s] to comply with the following activity and use limitations:

[Insert the limitations appropriate for the Property. Several limitations may be appropriate as part of a remedial action or closure plan where cleanup to an unrestricted land use is not feasible. Each type of limitation must be considered on a Property-specific basis to determine which limitation or combination of limitations is suitable for the particular circumstances of the Property, based on the applicable program standards or cleanup goals, the nature of contamination, the affected media and the potential exposures. The types of limitations include:

land use limitations (e.g., to limit duration and frequency of human exposure to surficial soils, surface water, or sediments.)

ground water limitations (e.g., to prevent exposure to contaminated ground water by prohibiting extraction or use of ground water, except for investigation or remediation thereof.)

disturbance limitations (e.g., to protect in-place remedial systems, to prevent exposures caused by any mixing of contaminated subsurface soils with "clean" surface soils, and to prevent contact with subsurface contamination during excavation.)

construction limitations (e.g., to prevent exposure to volatile emissions to indoor air from soil or ground water.)

resource protection limitations (e.g., to protect certain ecological features associated the Property . . .)]

[add the following, if appropriate: If any event or action by or on behalf of a person who owns an interest in or holds an encumbrance on the Property, identified in paragraph 11 below, constitutes a breach of the activity and use limitations, Owner or Transferee shall notify Ohio EPA within [thirty (30)] days of becoming aware of the event or action, and shall remedy the breach of the activity and use limitations within [sixty (60)] days of becoming aware of the event or action, or such other time frame as may be agreed to by the Owner or Transferee and Ohio EPA.]

6. Running with the Land. This Environmental Covenant shall be binding upon the Owner[s] and all assigns and successors in interest, including any Transferee, and shall run with the land, pursuant to ORC § 5301.85, subject to amendment or termination as set forth herein. The term "Transferee," as used in this Environmental Covenant, shall mean any future owner of any interest in the Property or any portion thereof, including, but not limited to, owners of an interest in fee simple, mortgagees, easement holders, and/or lessees.
7. Compliance Enforcement. Compliance with this Environmental Covenant may be enforced pursuant to ORC § 5301.91. Failure to timely enforce compliance with this Environmental Covenant or the activity and use limitations contained herein by any party shall not bar subsequent enforcement by such party and shall not be deemed a waiver of the party's right to take action to enforce any non-compliance. Nothing in this Environmental Covenant shall restrict the Director of Ohio EPA from exercising any authority under applicable law. *[VAP¹: Pursuant to ORC § 3746.05, if the Property or any portion thereof is put to a use that does not comply with this Environmental Covenant, the covenant not to sue issued for the Property by the Director of Ohio EPA under ORC § 3746.12 is void on and after the date of the commencement of the noncomplying use.]*
8. Rights of Access. Owner[s] hereby grant[s] to Ohio EPA, its agents, contractors, and employees *[and any "Holders;" the local government, etc.; see ORC §§ 5301.82(A)(6) and 5301.91(A)]* the right of access to the Property for implementation or enforcement of this Environmental Covenant.
9. Compliance Reporting. Owner[s] or any Transferee shall submit to Ohio EPA *[local government, "Holders" other than Owner]* on *[an annual]* basis written documentation verifying that the activity and use limitations remain in place and are being complied with.

¹ If the Property is the subject of a VAP no further action letter and request for a covenant not to sue, this language should be added to this paragraph of the Environmental Covenant

10. Notice upon Conveyance. Each instrument hereafter conveying any interest in the Property or any portion of the Property shall contain a notice of the activity and use limitations set forth in this Environmental Covenant, and provide the recorded location of this Environmental Covenant. The notice shall be substantially in the following form:

THE INTEREST CONVEYED HEREBY IS SUBJECT TO AN ENVIRONMENTAL COVENANT, DATED _____, 200_, RECORDED IN THE DEED OR OFFICIAL RECORDS OF THE COUNTY RECORDER ON _____, 200_, IN [DOCUMENT _____, or BOOK _____, PAGE _____]. THE ENVIRONMENTAL COVENANT CONTAINS THE FOLLOWING ACTIVITY AND USE LIMITATIONS: *[Insert the language that describes the activity and use limitations exactly as it appears in the Environmental Covenant.]*

Owner[s] shall notify Ohio EPA *[and any "Holders" other than the Owner]* within *[ten (10)]* days after each conveyance of an interest in any portion of the Property. Owner's[s] notice shall include the name, address, *and telephone number* of the Transferee, a copy of the deed or other documentation evidencing the conveyance, and a survey map that shows the boundaries of the property being transferred.

11. Representations and Warranties. Owner[s] hereby represent[s] and warrant[s] to the other signatories hereto:

A. that the Owner[s] is [are] the sole owner[s] of the Property;

B. that the Owner[s] hold[s] fee simple title to the Property which is *[use either of the following, as appropriate:]*

free, clear and unencumbered; [or]

subject to the interests or encumbrances identified in Exhibit B attached hereto and incorporated by reference herein;

C. that the Owner[s] has [have] the power and authority to enter into this Environmental Covenant, to grant the rights and interests herein provided and to carry out all obligations hereunder;

- D. that the Owner[s] has [have] identified all other persons that own an interest in or hold an encumbrance on the Property and notified such persons of the Owner's[s] intention to enter into this Environmental Covenant;[and]
 - E. that this Environmental Covenant will not materially violate or contravene or constitute a material default under any other agreement, document or instrument to which Owner[s] is [are] a party or by which Owner[s] may be bound or affected; [and] [add the following, if appropriate:]
 - [F. *to the extent that any other interests in or encumbrances on the Property conflict with the activity and use limitations set forth in this Environmental Covenant, the persons who own such interests or hold such encumbrances have agreed to subordinate such interests or encumbrances to the Environmental Covenant, pursuant to ORC § 5301.86, and the subordination agreement(s) (attached hereto as Exhibit C; [or] recorded at _____).*]
12. Amendment or Termination. This Environmental Covenant may be amended or terminated by consent of all of the following: the Owner[s] or a Transferee; [other "Holders," if any;] and the Ohio EPA,² pursuant to ORC § 5301.90 and other applicable law. The term, "Amendment," as used in this Environmental Covenant, shall mean any changes to the Environmental Covenant, including the activity and use limitations set forth herein, or the elimination of one or more activity and use limitations when there is at least one limitation remaining. The term, "Termination," as used in this Environmental Covenant, shall mean the elimination of all activity and use limitations set forth herein and all other obligations under this Environmental Covenant.

This Environmental Covenant may be amended or terminated only by a written instrument duly executed by the Director of Ohio EPA and the Owner[s] or Transferee [and other "Holders," if any] of the Property or portion thereof, as applicable. Within thirty (30) days of signature by all requisite parties on any amendment or termination of this Environmental Covenant, the Owner[s] or Transferee shall file such instrument for recording with the _____ County Recorder's Office, and shall provide a file- and date-stamped copy of the recorded instrument to Ohio EPA.

² See ORC § 5301.82 (B) (3), which allow for "limitations on amendment or termination "

[alternative paragraph for resource protection limitations]

13. Severability. If any provision of this Environmental Covenant is found to be unenforceable in any respect, the validity, legality, and enforceability of the remaining provisions shall not in any way be affected or impaired.
14. Governing Law. This Environmental Covenant shall be governed by and interpreted in accordance with the laws of the State of Ohio.
15. Recordation. Within *[thirty (30)]* days after the date of the final required signature upon this Environmental Covenant, Owner[s] shall file this Environmental Covenant for recording, in the same manner as a deed to the Property, with the _____ County Recorder's Office.
16. Effective Date. The effective date of this Environmental Covenant shall be the date upon which the fully executed Environmental Covenant has been recorded as a deed record for the Property with the _____ County Recorder.
17. Distribution of Environmental Covenant. The Owner[s] shall distribute a file- and date-stamped copy of the recorded Environmental Covenant to: Ohio EPA; the *[City, County, Township, Village]* of _____; *[any "Holder," any lessee, each person who signed the Environmental Covenant, each person holding a recorded interest in the Property; and any other person designated by Ohio EPA; see ORC § 5301.83].*
18. Notice. Unless otherwise notified in writing by or on behalf of the current owner or Ohio EPA, any document or communication required by this Environmental Covenant shall be submitted to:

[title or position]
Division of [_____]
Ohio EPA
P.O. Box 1049
Columbus, Ohio 43216-1049

[title or position]
[address]

The undersigned [representative of] Owner[s] *[and other "Holders," if any]*

represent[s] and certiff[y/ies] that [he/she/they] [is/are] authorized to execute this Environmental Covenant.

IT IS SO AGREED:

[NAME OF OWNER]

Signature of Owner[s]

Printed Name and Title

Date

State of _____)

County of _____)

ss:

Before me, a notary public, in and for said county and state, personally appeared _____, a duly authorized representative of _____, who acknowledged to me that [he/she] did execute the foregoing instrument on behalf of _____.

IN TESTIMONY WHEREOF, I have subscribed my name and affixed my official seal this ____ day of _____, 20__.

Notary Public

OHIO ENVIRONMENTAL PROTECTION AGENCY

Joseph P. Koncelik, Director

Date

State of Ohio)

County of Franklin)

ss:

Before me, a notary public, in and for said county and state, personally appeared Joseph P. Koncelik, the Director of Ohio EPA, who acknowledged to me that he did execute the foregoing instrument on behalf of Ohio EPA.

IN TESTIMONY WHEREOF, I have subscribed my name and affixed my official seal this ____ day of _____, 20__.

Notary Public

[NAME OF HOLDER]

Signature of Holder

Printed Name and Title

Date

State of _____)

County of _____)

ss:

Before me, a notary public, in and for said county and state, personally appeared _____, a duly authorized representative of _____, who acknowledged to me that [he/she] did execute the foregoing instrument on behalf of _____.

IN TESTIMONY WHEREOF, I have subscribed my name and affixed my official seal this ____ day of _____, 20__.

Notary Public

This instrument prepared by:

[name, address]